



# **Tennessee Department of Environment and Conservation**

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**DOE Oversight Division**



**Status Report to the Public  
2007**

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# Acronyms

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<b>BMAP</b>	Biological Monitoring and Abatement Program	<b>NPDES</b>	National Pollutant Discharge Elimination System
<b>CAP</b>	Citizens' Advisory Panel	<b>ORNL</b>	Oak Ridge National Laboratory
<b>CERCLA</b>	Comprehensive Environmental Response, Compensation, and Liability Act of 1980	<b>ORR</b>	Oak Ridge Reservation
<b>CRM</b>	Clinch River Mile	<b>PCB</b>	polychlorinated biphenyl
<b>D&amp;D</b>	decontamination and decommissioning	<b>pCi/g</b>	picocuries per gram
<b>DOE</b>	U.S. Department of Energy	<b>pCi/L</b>	picocuries per liter
<b>EA</b>	Environmental Assessment	<b>PCM</b>	Poplar Creek Mile
<b>EMWMF</b>	Environmental Management Waste Management Facility	<b>RCRA</b>	Resource Conservation and Recovery Act of 1976
<b>EPA</b>	U.S. Environmental Protection Agency	<b>ROD</b>	Record of Decision
<b>ETTP</b>	East Tennessee Technology Park	<b>TDEC</b>	Tennessee Department of Environment and Conservation
<b>FFA</b>	Federal Facility Agreement	<b>TEMA</b>	Tennessee Emergency Management Agency
<b>FY</b>	fiscal year	<b>TLD</b>	thermoluminescent dosimeter
<b>LOC</b>	Oak Ridge Reservation Local Oversight Committee, Inc.	<b>TOA</b>	Tennessee Oversight Agreement
<b>mrem</b>	millirem, a measure of the effect of radiation on the body	<b>TRU</b>	transuranic
<b>NEPA</b>	National Environmental Policy Act	<b>TSCA</b>	Toxic Substances Control Act of 1976
<b>NNSA</b>	National Nuclear Security Administration	<b>TVA</b>	Tennessee Valley Authority
		<b>UF<sub>6</sub></b>	uranium hexafluoride
		<b>VOC</b>	volatile organic compound

# Executive Summary

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## BACKGROUND

Oak Ridge, Tennessee, is home to the U.S. Department of Energy's (DOE's) 35,545-acre Oak Ridge Reservation (ORR). Created in 1942, the ORR was the first of several enormous complexes across the nation supporting the Manhattan Project, a massive, top-secret World War II effort to build the atomic bomb. After the war, the ORR's mission shifted to Cold War nuclear weapons production at the Y-12 plant, uranium enrichment at the K-25 Gaseous Diffusion Plant, and scientific research at Oak Ridge National Laboratory (ORNL). These facilities used many hazardous and radioactive materials, with wastes disposed of in pits, trenches, ponds, and waterways.

Over the last 66 years, DOE and agencies that preceded it contaminated more than 500 sites on or near the ORR; approximately 15 percent of the ORR's total area has been affected. These sites are being remediated to levels that comply with current environmental laws, particularly the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

## SCOPE OF THIS STATUS REPORT

In 1991, DOE signed the Tennessee Oversight Agreement (TOA) with the state. Under the TOA, DOE provides funding for the Tennessee Department of Environment and Conservation DOE Oversight Division (the "division") to perform independent environmental monitoring and oversee DOE's ongoing operations at the ORR.

This status report covers fiscal year 2007—from July 2006 through June 2007. It summarizes Tennessee's perspective on DOE's ongoing program at Oak Ridge as it pertains to the health and safety of area citizens and protection of the environment. And it interprets the results of state monitoring and analysis and the quality of DOE environmental monitoring and surveillance programs.

## MAJOR FINDINGS

DOE has continued to make good progress under The Accelerated Cleanup Plan begun in 2002. At

East Tennessee Technology Park (ETTP, the former K-25 site) decontamination and decommissioning (D&D) of the three youngest gaseous diffusion buildings has been essentially completed. At ORNL, DOE has completed capping of the radioactive waste burial grounds in Melton Valley. All of the uranium hexafluoride cylinders at ETTP have been either shipped to the Portsmouth Gaseous Diffusion Plant in Ohio or otherwise appropriately disposed of. And the backlog of low-level legacy waste has been worked down so that only "orphan" wastes remain, awaiting a disposal pathway.

DOE still faces difficult decisions regarding cleanup of groundwater and D&D of deteriorating facilities at ORNL and Y-12. Newly generated low-level radioactive waste has begun to accumulate at operating facilities instead of being disposed of in a timely manner. A major challenge will be obtaining the resources necessary to continue the cleanup work.

Cleanup of the ORR will leave the reservation much less hazardous to people and the environment; nevertheless, continued maintenance, monitoring, and institutional controls—effective "stewardship"—will be required even after cleanup activities are completed.

## KEY ISSUES AND CHALLENGES

The division has identified several areas that continue as cause for concern to DOE, regulatory agencies, and the community. Satisfactory resolution of these issues may be time consuming and costly. The key issues and challenges are listed below and described more fully in Section 6.

- Characterization and disposal of newly generated radioactive waste,
- The determination of whether—and how—to remediate contaminated groundwater,
- Planning, funding and implementation of long-term stewardship strategies, and
- The federal commitment to fund cleanup activities and waste disposal.





TDEC photo

Historical disposal practices included dumping radioactive and hazardous waste into unlined trenches.

# 1. Introduction

## 1.1. HISTORICAL BACKGROUND

Since it was established in 1942, the Oak Ridge Reservation (ORR) has served a variety of purposes for the federal government. It was key to the Manhattan Project, America's all-out effort to develop the atomic bomb during World War II, as well as to Cold War nuclear weapons production. It has been an important home for scientific research. And it has hosted a substantial radioactive waste management effort.

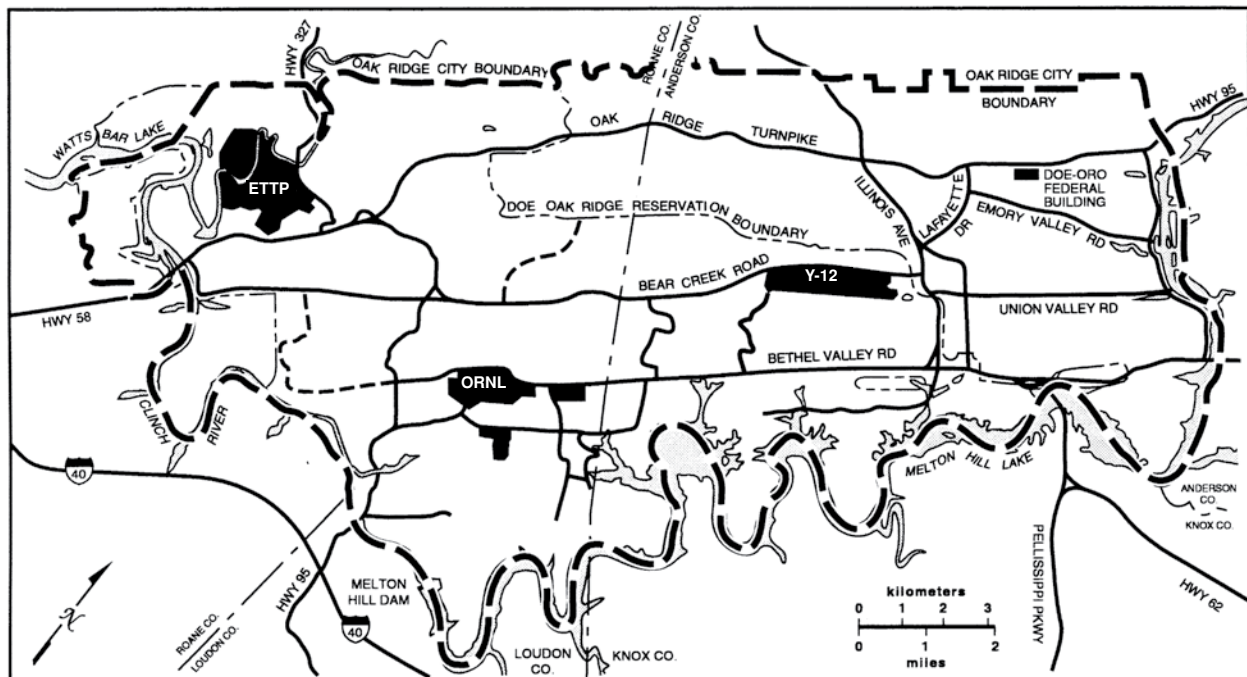
The ORR is now owned by the U.S. Department of Energy (DOE) and is managed by contractors at each of its three major sites: Oak Ridge National Laboratory (ORNL), the Y-12 National Security Complex, and East Tennessee Technology Park (ETTP). ETTP, which was originally the K-25 uranium enrichment plant, is in the process of being cleaned up for ultimate reuse by private businesses. Y-12, which originally produced enriched uranium and weapons components, is being modern-

ized for safer and more efficient handling of weapons components and secure storage of highly enriched uranium. And ORNL, which was created under the name X-10 to develop methods for plutonium production, is being modernized to enhance diverse civilian research and computing activities.

Environmental monitoring, both of past contamination and of current cleanup efforts, is crucial to the success of current and future missions. It is also necessary to assure that the off-site environment and public health are protected.

## 1.2. DIVISION OBJECTIVES

DOE and the state signed the Tennessee Oversight Agreement (TOA) in 1991 to ensure that public health and the environment are not harmed by activities on the ORR. Among other provisions, the agreement allowed for a new division to be created within the Tennessee Department of Environment



*The Oak Ridge Reservation lies about 20 miles west of Knoxville and straddles Roane and Anderson Counties. Map courtesy of U.S. Department of Energy (Oak Ridge Reservation Annual Site Environmental Report for 1998, DOE/ORO/2091).*



and Conservation (TDEC) to keep track of DOE activities. The DOE Oversight Division (“the division”) pursues its mission through five primary objectives:

- To monitor and enforce DOE’s compliance with applicable laws, regulations, Oak Ridge Federal Facility Agreement (FFA) provisions, the TOA, DOE Orders, administrative policies, approved procedures, and appropriate guidelines (Section 2);
- To characterize and identify radiological and hazardous (but nonradiological) contaminants and exit pathways on the ORR and in surrounding areas and to determine the potential impact of DOE activities on the welfare of Tennessee’s citizens and environment (Section 3);

- To evaluate the effectiveness of radiological controls implemented on the ORR by DOE and its contractors (Sections 3 and 4);
- To ensure that DOE chooses appropriate remediation, waste disposition and other corrective measures necessary to provide a healthful environment for the citizens of the state (Section 4); and
- To monitor contaminant releases in emergencies and provide requested services to the Tennessee Emergency Management Agency (TEMA) as described in its Multi-Jurisdictional Emergency Response Plan for the ORR (Section 5).

These activities and the current status of environmental health on the ORR are summarized in this report.



TDEC photo

Log cabin predating the Manhattan Project near Y-12.



## 2. Jurisdiction

### 2.1. TENNESSEE OVERSIGHT AGREEMENT AND THE DOE OVERSIGHT DIVISION

The state and DOE signed the TOA in 1991, and TDEC created the division the same year to carry out its responsibilities under the agreement. The TOA provides a framework and funding for the state to oversee DOE's impact on the community in four ways:

- Through a regulatory program to support state participation in the FFA (see Section 2.2 and Section 4);
- Through a non-regulatory program of independent environmental monitoring and oversight to supplement actions taken under applicable environmental laws and regulations (Section 3);
- Through an emergency response program to help ensure that the state and local communities are prepared in case DOE creates an off-site emergency (Section 5); and
- Through an outreach program that enhances citizen and local government awareness and involvement in DOE's Oak Ridge operations (Section 7).

### 2.2. FEDERAL FACILITY AGREEMENT

The state, DOE, and the U.S. Environmental Protection Agency (EPA) ratified the FFA in 1992. It provides a legal framework allowing the division to enforce DOE cleanup of contamination from past ORR activities. Oak Ridge has an FFA because the ORR is listed on the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) National Priorities List.

The division coordinates state activities under the FFA. The agreement itself outlines a procedure for cleanup on the reservation, including the identification of problems, scheduling of activities, and implementation and monitoring of responses. Actions taken under the FFA conform to

### ENVIRONMENTAL LAWS

The major laws that govern DOE's environmental activities on the ORR are listed below with informational Web sites:

- Comprehensive Environmental Response, Compensation, and Liability Act of 1980 <<http://www.epa.gov/lawsregs/laws/cercla.html>>
- Resource Conservation and Recovery Act of 1976 <<http://www.epa.gov/lawsregs/laws/rcra.html>>
- National Environmental Policy Act of 1969 <<http://www.epa.gov/lawsregs/laws/nepa.html>>
- Natural Resources Damage Assessment <<http://restoration.doi.gov/>>

Other laws applicable to environmental management at the ORR include the Clean Air Act (1970), Clean Water Act (1977), Emergency Planning and Community Right-to-Know Act (1986), Federal Hazardous Substance Act (1966), Federal Facility Compliance Act (1992), Safe Dam Act (1973), Safe Drinking Water Act (1974), Solid Waste Disposal Act (1965), and Toxic Substances Control Act (1976).

CERCLA, the Resource Conservation and Recovery Act of 1976 (RCRA), and other federal and state laws.

The National Environmental Policy Act of 1969 (NEPA) applies to proposed federal actions that could significantly affect the human environment and requires federal agencies to consider environmental impacts and provide for public review and comment. Although NEPA reviews are not required for projects performed under CERCLA, DOE is required to incorporate NEPA values (i.e.,

consideration of public input on potential impacts to the environment) into CERCLA actions.

CERCLA documents related to ORR cleanup are available for public review at DOE's Information Center (see Section 7.4).

### **2.3. NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)**

NEPA requires federal agencies to ensure that citizen participation and environmental impacts are properly factored into the agency's decision-making. The division commented on the following NEPA documents in fiscal year (FY) 2007:

- Environmental Assessment (EA) for the Oak Ridge Science and Technology Project at the Oak Ridge National Laboratory (DOE/EA-1575). This environmental assessment evaluates the potential impacts of enlarging the facilities to support ORNL's technology transfer mission. The final environmental assessment is expected in FY 2008.
- Draft EA for the Y-12 Steam Plant Life Extension Project (DOE-EA-1514). This project would ensure a long-term source of steam production at Y-12. The final environmental assessment is yet to be released.
- EA for the U-233 Stabilization and Building 3019 Complex Shutdown at the Oak Ridge National Laboratory (DOE/EA-1574). DOE wants to downblend the uranium-233 (U-233) stored at the ORNL building 3019 complex in order to enhance safeguards and security, eliminate long-term worker safety and criticality concerns, and place the U-233 material in safe storage while it awaits future decisions regarding disposal. A finding of no significant impact issued in March 2007 allows the agency to move forward.

NEPA requires that decisions be made through a sustained process of inquiry, analysis, and learning. It ensures that federal agencies give the public an opportunity to learn about and comment on significant proposals. When followed as required, it

ensures adequate planning and prevents costly mistakes.

NEPA documents related to federal decisions affecting the ORR are available for public review at DOE's Information Center (see Section 7.4.4) and online at <<http://www.eh.doe.gov/nepa/>>.

### **2.4. OTHER PLANNING AND POLICY ISSUES**

The division reviewed and commented on the Draft DOE Environmental Management Engineering and Technology Roadmap, a report mandated by Congress to determine what technologies were needed to address DOE's most pressing environmental problems.

Staff in the division's Environmental Monitoring and Compliance Program each year review a variety of DOE documents not necessarily required by law. Examples include the Annual Site Environmental Report, revisions to DOE Orders, and other documents that reflect the health of the environment and status of monitoring and surveillance on the ORR. Program staff forward any concerns they have to DOE for resolution.

### **2.5. NATURAL RESOURCES DAMAGE ASSESSMENT**

In March 2005, the state and DOE finalized an Indefinite Term Easement setting aside approximately 3,000 acres on the ORR for conservation purposes. This easement, located on portions of Black Oak Ridge and McKinney Ridge near ETTP, is intended to partially offset damage to Watts Bar Reservoir caused by contamination from the ORR. The property will be maintained by the state for natural resource management and low-impact recreational.

A DOE contractor is in the process of comparing the damage to Lower Watts Bar Reservoir with the resource value of the conservation easement. Once this assessment has been completed, the Natural Resource Damage Assessment Trustee Council will decide whether the easement fully offsets damage to the reservoir.

## 3. Monitoring the Environment

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### 3.1. WATER QUALITY

#### 3.1.1. Drinking Water Supplies

**Distribution Systems.** The division continued in FY 2007 to oversee maintenance and compliance activities for the water treatment plant (K-1515) and the three distribution systems serving DOE's Oak Ridge facilities.

This work includes the following:

- Independent monitoring of residual chlorine levels; and
- Oversight of cross-connection controls, water line repairs, and the general status of distribution systems.

The division did not detect any threats to worker or public safety from the potable water systems. However, given the challenges present on the ORR—including radioactive waste burial grounds and soils and groundwater contaminated with hazardous and radioactive substances—evaluation of the potable water distribution systems at the three plant sites remains an ongoing need. Noteworthy events include the following:

- **ORNL.** The division continues to oversee routine drinking water monitoring and backflow prevention devices at ORNL. In addition, the division oversees line breaks and other anomalies in the distribution system. TDEC's Division of Water Supply will conduct a sanitary survey of the ORNL distribution system in late 2007 by TDEC's Division of Water Supply with support from the division.
- **Y-12.** An October 27, 2004, Notice of Violation detailed inadequacies in Y-12's cross connection control program. The Division of Water Supply has accepted the draft revision of the plant's improvement and expects that implementation of the plan will address inadequacies identified in the program. Assessment of the program will be ongoing, as the implementation schedule covers approximately 19 months. Acceptance of the

plan does return the Y-12 Water System to compliance. It does not, however, alter the current "provisional" rating of the system linked to the system's failure to collect the required eight bacteriological samples in January 2006; only seven samples were submitted for analysis.

- **ETTP.** Continuing decontamination and decommissioning (D&D) has reduced the size of the water distribution system at ETTP. Lines are being taken out of service and cut and capped as demolition proceeds. The division continues to oversee routine drinking water monitoring and backflow prevention devices at ETTP. In addition, the division oversees line breaks and other anomalies in the distribution system. This system is scheduled to be transferred to the City of Oak Ridge.

**RadNet Drinking Water Program.** Radioactive contaminants released on the ORR enter local streams and are transported to the Clinch River, which is used as a source of raw water by local drinking water suppliers. EPA's RadNet Drinking Water Program provides a means to evaluate the impact of these contaminants on area water systems and verify DOE monitoring. In the Oak Ridge RadNet effort, EPA provides radiochemical analysis of finished drinking water collected quarterly from five local water systems by division air and water staff. Utilities sampled include the Gallaher Water Treatment plant at ETTP, the Oak Ridge Water Treatment Plant at Y-12, the West Knoxville Utility District, the Kingston Water Treatment Plant, and the Anderson County Utility District. Results for all five local water treatment facilities have been well within applicable drinking water standards for the radionuclides analyzed.

#### 3.1.2. Groundwater

The groundwater program oversees and independently monitors contaminated groundwater on the ORR and nearby. The program includes approximately 60 sampling points. These are mostly seeps and springs, but residential wells are increasingly being included in the sampling regime. Division



sampling and analysis helps evaluate the accuracy of assumptions regarding groundwater movement and contaminant transport. The program also includes independent mapping of groundwater basins by dye tracing in karst bedrock both on and off the ORR.

**ETTP.** Contaminated springs exist at ETTP's periphery. The division's groundwater program monitors two sites that consistently show contamination from volatile organic compounds (VOCs). These sites, a spring on the edge of Poplar Creek near Blair Road and a seep southwest of ETTP on the bank of the Clinch River, show trichloroethylene levels that are consistently near or above drinking water limits.

The groundwater program also monitors Rose Bailey Spring about 6 miles southwest of ETTP. At 150 gallons/minute, this spring likely represents a regional discharge and is monitored to assess potential regionwide impact from ETTP contaminants. TDEC has not detected any substances in Rose Bailey Spring that can be linked to DOE operations past or present.

**Melton Valley.** The division's groundwater program monitors results from Melton Valley "picket wells"—used to evaluate water leaving the ORR—and is scheduled to perform split sampling of the wells. The division also samples a number of residential water wells and two U.S. Geological Survey wells directly across the Clinch River from Melton Valley.

Results suggest the picket wells are within a contamination plume originating from the hydrofracture projects. During the 1960s, '70s, and early '80s, large quantities of radioactive waste (published estimates are on the order of 1.4 million curies) were mixed with grout and disposed by deep underground injection. Groundwater monitoring results raise serious concerns, especially because the residential area directly across the Clinch River from Melton Valley depends largely on groundwater for domestic use.

**Y-12.** The groundwater program performs occasional split sampling on- and off-site monitoring for Y-12. Two off-site springs (Cattail Spring and

Bootlegger Spring) are monitored because they have been found with VOCs originating at or near Y-12. The program also regularly samples a series of springs and two surface water sites along Bear Creek to monitor the impact of remedial activities in Bear Creek Valley and operation of the CER-CLA waste facility and to provide background and monitoring of Spallation Neutron Source operations.

### 3.1.3 Surface Water

**Clinch River and Tributary Surface Water Sampling.** The division has not observed substantial concentrations of pollutants coming from the ORR. The division's Environmental Monitoring and Compliance Program sampled surface water in FY 2007 twice at 20 sites on the Clinch River and some of its tributaries. The purpose of this project is to detect contamination emanating from DOE ORR sites. After sample analysis was completed, the results were compared with Tennessee Water Quality Criteria. With the exception of the E. coli values at two locations (Clinch River Mile [CRM] 52.6 and East Fork Walker Branch), the measured contaminants were within acceptable ranges of the Tennessee Water Quality Criteria, a state water quality standard published by TDEC and based on the Clean Water Act. These E. coli values are unusual when past data at these sites is taken into consideration. Most radioactive contaminants were within DOE's Preliminary Remediation Goals. The exceptions—lead-212 and lead-214—occur naturally and likely did not come from DOE operations. Full results of the sampling effort are published in the April 2007 Annual Monitoring Report, available to the public from the division.

Although the state has found that White Oak Creek is not supporting its designated uses under the Water Quality Criteria, contamination from the creek does not cause the Clinch River to fail in supporting its designated use. This is because the Clinch is a much larger stream and, therefore, dilutes contaminants from White Oak Creek.

**Water Quality Monitoring.** The division's Environmental Monitoring and Compliance Program monitored surface water at eight sites representing three watersheds during FY 2007. Seven,

including two sites on East Fork Poplar Creek, four on Bear Creek, and one on Mitchell Branch, were chosen to detect possible contamination from DOE watersheds. The eighth, Mill Branch, is located off site and provided background data.

The sites were sampled twice a month in FY 2007, and results can be found in the April 2007 Annual Monitoring Report, available to the public from the division. Ambient water quality parameters were measured (i.e., pH, conductivity, turbidity, dissolved oxygen, temperature), and the results were compared with Tennessee Water Quality Criteria.

Results for 2007 generally met state water quality criteria for the parameters observed. However, consistently high conductivity readings were measured in the upper reaches of Bear Creek.

### 3.1.4. Stream Periphyton Monitoring

The division's Environmental Monitoring and Compliance Program sampled stream periphyton (algae and diatoms) at 14 monitoring stations in FY 2007 to evaluate the recovery of East Fork Poplar Creek, Bear Creek, and White Oak Creek watersheds. Ten of these stations were chosen to detect possible shifts in periphyton community structure due to DOE activity. The other four provide background data. Periphyton communities respond rapidly to environmental changes or stressors, provide a continuous record of water quality, and reveal various natural and man-made changes to the environment.

The monitoring stations were sampled monthly during 2006, and results are published in the April

2007 Annual Monitoring Report, available to the public from the division. Results were analyzed against EPA standards because there are no regulatory guidelines for periphyton water quality, either at the state or federal level.



Division personnel sample surface water at Ernie's Creek.

TDEC photo

They suggest a general trend of improving downstream water quality as you move further from Y-12 along both Bear Creek and East Fork Poplar Creek. Closer to the plant, these two watersheds continue to show impaired water quality, based on periphyton community response to human activity. The results for White Oak Creek are inconclusive.

### 3.1.5. Stream Periphyton Monitoring

The division's Environmental Monitoring and Compliance Program sampled stream periphyton (algae and diatoms) at 14 monitoring stations in FY 2007 to evaluate the recovery of East Fork Poplar Creek, Bear Creek, and White Oak Creek watersheds. Ten of these stations were chosen to monitor changes in periphyton due to DOE-related impacts in the three respective watersheds. The other four are designated as reference stations and provide background data. Periphyton communities respond rapidly to environmental changes and provide a continuous record of water quality.

The monitoring stations were sampled monthly during 2006, and detailed results are found in the division's April 2007 Annual Monitoring Report.

Results of the 2006 periphyton monitoring suggest that downstream water quality is improving in Bear Creek and East Fork Poplar Creek the farther these streams get from Y-12 contamination

sources. The upper reaches of these two watersheds, however, continue to exhibit impaired water quality. The results for White Oak Creek are inconclusive.

## 3.2. AIR QUALITY

### 3.2.1. Ambient Air Monitoring for Volatile Organic Compounds

The division sampled air at Mitchell Branch at ETTP for total VOCs in December 2006 in an effort to provide an independent assessment of the ambient environment and evaluate the impact of DOE operations.

Water samples taken in October 2006 had greatly elevated VOC contamination, and the main objective of this pilot project was to measure ambient airborne VOCs. A groundwater collection trench and removal wells had recently been employed to remediate groundwater, but use of the extraction wells and trench was discontinued over cost-effectiveness and operational issues. Because the trench still collects groundwater and the pumps are turned off, the contaminated groundwater is finding a new path to the surface, named “Tom’s Seep.”

Elevated VOCs have been measured at Tom’s Seep and Mitchell Branch. A photoionization detector measured total VOCs from the ambient air. The levels were elevated above 1,000 parts per billion for 3 1/2 days. Because this is a pilot project, adjustments will be made to the sampling apparatus and the test will be run again. Until then, division personnel will use the photoionization detector to check the ambient total VOC levels when sampling this location. This project demonstrated that microclimate is important when evaluating

pollutants in localized outdoor air. Furthermore, land use decisions at ETTP should consider volatile chemicals in outdoor air.

### 3.2.2. Air Pollution Monitoring for Heavy Metals.

In 1997 the division established an independent monitoring effort to identify overall levels of hazardous pollutants in the air at and around ETTP. The division established comparable air monitoring programs at ORNL and Y-12 during calendar year 1999. Through calendar year 2006, high-volume air samplers were operated at these sites.

Samples were collected weekly and analyzed at the state environmental laboratory in Nashville for arsenic, beryllium, cadmium, chromium, lead, nickel, and uranium as a metal. Throughout the history of this monitoring program, concentrations of hazardous metals in air have been below regulatory guidelines even when they exceeded laboratory detection limits.

The ORNL sampler was relocated to the main ORNL plant area and used for sampling radiological constituents in the air throughout fall 2006. Changes in the

program during the past year, including the compositing of samples prior to analysis, will facilitate comparisons of future data with heavy metal data collected by DOE.

### 3.2.3. RadNet Air Monitoring Program

EPA’s RadNet program monitors major sources around the country for significant releases of radiation—either routine or accidental—that could result in public exposure. Division staff collect air samples twice a week from five RadNet air monitors on the ORR and submit the samples for radiochemical analysis to EPA’s National Air and Radiation Environmental Laboratory.



EPA RadNet air monitor.

TDEC photo



Results for calendar year 2006 did not exceed the screening level of 1.0 picocurie per cubic meter. Gross beta results for each of the five RadNet monitors showed concentrations well below levels of concern, indicating that there is no significant impact on the local environment or public health.

### **3.2.4. Perimeter Air Monitoring Program**

The Perimeter Air Monitoring Program monitors exit pathways for air pollutants released on the ORR and verifies DOE monitoring data. Samples are collected biweekly from 12 air monitors located at the ORR boundaries and at one background station (Fort Loudoun Dam). Nine of the samples are collected by DOE contractors and provided to the division. Analysis is performed at the state radiochemical laboratory. Data derived from this program are used to (1) assess the impact of DOE activities on public health and the environment, (2) identify and characterize unplanned releases, (3) establish trends in air quality, and (4) verify data generated by DOE and DOE contractors.

Calendar year 2006 results were similar to those reported for the background station, meaning there is no impact on public health and the environment. Anomalous concentrations below background were noted at three stations. Division staff are reviewing these anomalies, which may be due to equipment failure or sampling error.

### **3.2.5. Fugitive Air Monitoring Program**

The program monitors locations where remedial and waste management activities on the ORR might cause the release of fugitive or diffuse emissions. Results from mobile high-volume air samplers are compared to data collected from a background station located at Fort Loudoun Dam. Samples are collected weekly and shipped to the state radiochemistry laboratory in Nashville for analysis.

In general, results were well below relevant standards, indicating there is no significant impact on the local environment or public health. However, one remedial site at ETTP near D&D activity had gross alpha and gross beta results greater than twice background levels on several occasions.

Despite this case, the results meet state and EPA criteria for risk. Clean Air Act standards apply to the yearly average of results and allow environmental concentrations for radionuclides equivalent to a dose greater than 10 millirem (mrem) above background in a year. These standards are applicable only to specific radionuclides, but even if the results are conservatively attributed to uranium-235 (primarily an alpha emitter) and strontium-90 (a beta emitter), results at all sites were well below Clean Air Act standards.

However, both state and federal laws require radiation released from a facility to be held to levels as low as reasonably achievable. Because background levels were more than doubled multiple times, D&D efforts on the ORR will continue to be monitored closely.

### **3.2.6. RadNet Precipitation Monitoring Program**

This program monitors the air by evaluating precipitation for radiological contaminants washed out of the atmosphere. Initially there was only one precipitation sampler, near the ORNL's High Flux Isotope Reactor and the Radiochemical Engineering Development Center, two facilities with relatively high radiological releases reported by DOE. A second sampler was added in April 2007 and is located northeast of the TSCA Incinerator (so named because it burns waste regulated by Toxic Substances Control Act of 1976) and ETTP.

Division staff collect samples twice weekly when 1 liter or more of precipitation is present and ship the samples for analysis to EPA's National Air and Radiation Environmental Laboratory in Montgomery, Alabama. Monthly composite samples are analyzed for tritium, gross beta, and gamma radiation levels. There are no standards that apply directly to contaminants in precipitation, but the data can indicate the presence of radioactive materials that may not be evident in particulate analysis. The project uses RadNet precipitation data at other locations in Tennessee, in adjacent states, and throughout the United States for comparison.

In 2006, data for the RadNet precipitation monitor varied considerably throughout the year. The tritium in precipitation results at the ORNL sampling location tended to be among the highest in the United States; however, the monitoring station is located near a reactor and nuclear waste burial grounds, while most of the other stations are located in major population centers. The gross beta results were lower than the national average.

While there is not a regulatory limit for tritium in precipitation, the limit for tritium in drinking water (20,000 picocuries per liter) is well above levels found at any site in the RadNet program. Consequently, the levels of tritium in precipitation on the ORR do not pose a hazard to the public or the environment.

### **3.3. SOIL AND SEDIMENT QUALITY**

#### **3.3.1. Sediment**

The division's Environmental Monitoring and Compliance Program samples sediments at 25 sites on the Clinch River and its tributaries in order to detect contamination from ORR sites. None are on streams such as White Oak Creek or Poplar Creek that have already been identified as contaminated and are currently monitored by DOE.

Sediment data from 2006 samplings show no contamination that exceeds DOE Preliminary Remediation Goals for recreation. Based on these criteria, these locations do not pose a threat to human health. New analysis should be performed on these sediments in the future if they are to be used for agricultural or other purposes. Sediments at certain sites do pose a threat to organisms that inhabit the biologically active zone of sediments.

Mercury levels in Clinch River samples are higher downstream of the river's confluence with Poplar Creek. Although the levels of mercury are well below the recreational Preliminary Remediation Goal, they are higher than at all of the other sediment sampling sites. The four Poplar Creek sediment sites show considerable predicted toxicity to sediment-dwelling organisms as a result of metals contamination, primarily from mercury.

Several locations show elevated cesium-137 levels in the sediment. The level in the small tributary of the Clinch at CRM 14.45 is considerably higher (11.0 picocuries per gram dry weight) than at any other site. This is likely because filters at the ETP Water Treatment Plant concentrated particles contaminated with cesium-137, and the filter backwash material was disposed in the K-1515C lagoon. Cesium-137 is found in the Clinch at levels slightly above background at most sites below the mouth of White Oak Creek. The levels are very low and are decreasing over time as a result of radioactive decay and the deposition of fresh sediment on the bottom. The contamination does not pose a threat to recreation or human health.

#### **3.3.2. Underwater Survey**

The Underwater Survey Project is an independent monitoring effort conducted by the division. The project searches for DOE-related contamination sources using a side-imaging sonar unit to survey the bottom of selected areas of the Clinch River and Poplar Creek. Two anomalous structures have been located to date.

The first, a large columnar concrete structure of unknown origin and use, is located at approximately CRM 12.9. Further investigation has failed to reveal any other information, and a radiological survey of the structure showed no apparent signs of contamination.

Historical and aerial photos of structures at the second site, located on Poplar Creek at approximately Poplar Creek Mile (PCM) 1.8, indicate that they are likely the remnants of an old causeway that crossed the creek but has since been removed (see Figures 1 and 2). There is no indication that these structures pose a threat to human health or the environment.

The "dotted line" in Figure 1 is the Central Neutralization Facility effluent pipeline to the Clinch River that is anchored with concrete collars. Other perspectives show the pipeline draped over the structures with the concrete anchor collars suspended above the streambed.

### 3.4. FOOD AND WILDLIFE QUALITY

#### 3.4.1. Milk Sampling

The division's Environmental Monitoring and Compliance Program oversees DOE's milk sampling program for the areas surrounding the ORR.

Contractors for DOE and UT-Battelle take samples of milk from two locations in the vicinity of the ORR and one background location in Maryville and analyze them for radiological contamination. The data show that milk from the sampling area is not contaminated.

#### 3.4.2. Vegetable Sampling

The division's Environmental Monitoring and Compliance Program oversees DOE's vegetable sampling program for areas around the ORR. DOE contractors purchase lettuce, tomatoes, and turnips from area gardeners for radiological analysis. There are six sampling sites: three in Oak Ridge, one between Kingston and Oak Ridge, one between Lenoir City and Oak Ridge, and one in the Claxton community. The data show no radiological contamination in the vegetables.

#### 3.4.3. Hay Sampling

The division's Environmental Monitoring and Compliance Program oversees DOE's hay sampling program for areas around the ORR. DOE contractors sample and analyze hay each year for gross alpha, gross beta, and gamma activity. Hay is sampled at seven locations around the ORR, including one background site near Norris Dam. The data show no radiological contamination in the hay.

#### 3.4.4. Fish Advisories and Water Contact Warnings

**Fish Consumption.** Division personnel conduct annual inspections of signs advising against fish consumption and water contact in waters that have been or could be contaminated by DOE. The advisory posting program is part of a larger, more encompassing sign-posting and inspection project coordinated by the TDEC Environmental Field Offices in Knoxville and Chattanooga.

The division focuses its efforts on waters in and around the ORR. Areas of responsibility

include the Clinch River and Melton Hill Lake above Melton Hill Dam, and Watts Bar Reservoir, including the Lower Clinch River, Tennessee River, and Lower Tennessee River arms. The advisory postings include warnings against consumption of catfish, striped bass, and Cherokee bass (striped bass/white bass hybrid).

Precautionary postings warn groups such as children, pregnant women, and nursing mothers not to eat any of the listed fish. All others are warned to limit their consumption to about two meals per month.

Fish included on precautionary signs are white bass, sauger, carp, smallmouth buffalo, and

largemouth bass. Up-to-date information on posted fishing waters in Tennessee may be found on the Internet at

<<http://www.state.tn.us/environment/wpc/publications/advisories.pdf>>.

Posting inspections are also conducted along East Fork Poplar Creek from the Y-12 Bear Creek Road entrance to the westernmost point at which Oak Ridge Turnpike crosses the stream. Signs have been placed along this portion of East Fork Poplar Creek, effectively covering the residential areas of

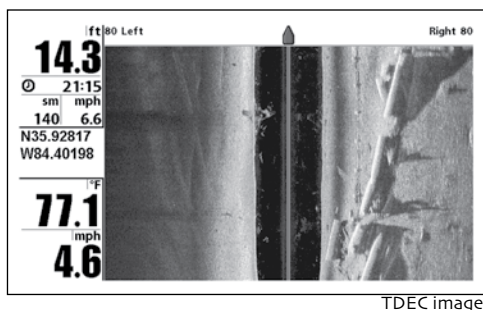


Figure 1. SONAR Image of Structure at PCM 1.8.

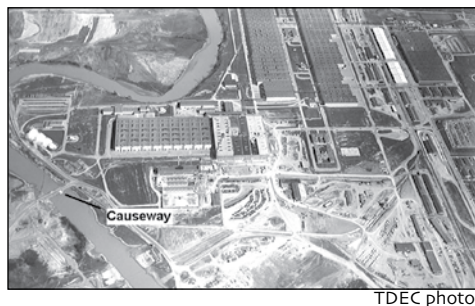


Figure 2. Structure at PCM 1.8.



Oak Ridge. Postings warn against swimming, wading, and fishing.

The 2007 sign posting inspections were conducted from April 16–April 23. Missing signs were replaced at seven of the 62 fish consumption sites. Damaged signs were reposted at two sites. Missing signs were replaced on East Fork Poplar Creek at two of the 36 water contact sites.

The division is participating in a joint effort with the TDEC Division of Water Pollution Control, the Tennessee Valley Authority (TVA), and ORNL to sample fish on Watts Bar Reservoir and analyze the tissue to determine if current postings need to be revised. TVA and ORNL will collect the fish, and the division will conduct analysis. The data will be given to the Division of Water Pollution Control for evaluation of current postings.

**Bacteria Levels of East Fork Poplar Creek.** The Division of Water Pollution Control continues to post lower East Fork Poplar Creek with a bacteriological advisory mandating no water contact.

From July 19, 2005, to August 17, 2005, division personnel collected water samples from nine sites along East Fork Poplar Creek and one along a tributary. With respect to *E. coli*, all nine sampling sites located directly on lower East Fork Poplar Creek were in compliance with Tennessee General Water Criteria for recreational use of surface water.

Sampling results both for *E. coli* and enterococci suggest that, relative to other locations on or near lower East Fork Poplar Creek, Y-12 is not a significant source of fecal contamination in the creek. However, the sampling results for enterococci indicate a need to identify and remedy the sources of bacterial contamination.

### 3.4.5. Aquatic Life

**Oversight of ORNL Sampling.** During spring 2007, division personnel conducted oversight trips in conjunction with ORNL Biological Monitoring and Abatement Program (BMAP) fish and benthic macroinvertebrate sampling. Established scientific sampling protocols and techniques were followed, and no concerns were noted.

**Independent Sampling.** Each year, the division conducts an independent assessment of benthic macroinvertebrate communities in streams on the ORR and off site. Most sampling sites overlap the BMAP sites and allow general comparison between results. The division has adopted the Division of Water Pollution Control Standard Operating Procedures for macroinvertebrate stream surveys. This method uses a semiquantitative approach and assesses the biotic integrity of a stream based on specific criteria developed for the unique region, or “ecoregion.” Results from the 2007 spring sampling event are published in the 2007 Environmental Monitoring Report. Results from prior years’ independent sampling events can be found in that year’s Environmental Monitoring Report. Surface water samples are collected semi-annually at all benthic macroinvertebrate sampling sites. Samples are analyzed for nutrient, microbiological, mercury, metal, radiological, and routine (residue and hardness) constituents. Sampling supports the benthic sampling and provides a snapshot of stream water conditions. Results of the surface water sampling efforts can be obtained from division Environmental Monitoring and Compliance personnel.

**Sampling for Radionuclides.** This program monitors aquatic biota to determine any impact on the food chain from contaminants in the surrounding environment. The scope of this project is to determine which areas on the ORR are most likely to be impacted by the uptake of radioactive contaminants through aquatic plants. The project may directly correlate with water quality in the surrounding area. Watercress is the preferred medium; it is abundant and it allows all aspects of sampling to be as similar as possible. In instances where there is no watercress or where watercress colonies are sparsely populated, various other water weeds or algae are sampled.

The data collected during 2006 from eight sampling sites indicate limited areas of elevated radionuclide concentrations in the watercress and other vegetation both on and off the ORR; however, these elevated radionuclide concentrations are below their respective Safe Drinking Water Act Action Levels, thus results protect the public

health and the environment and meet state and EPA criteria for risk. The division will focus on identifying areas of concern on and off the ORR to evaluate the potential for bioaccumulation of radionuclides in historically contaminated springs and seeps. The division will continue to sample and monitor aquatic vegetation to monitor aquatic ecosystem health and stream recovery.

### 3.4.6. Clinch River Fish Sampling

ORNL personnel monitor the Clinch River for potential public exposure to the consumption of contaminated fish. Sunfish and catfish are collected annually at designated test sites and reference locations in the river. Fish fillets are analyzed for metals, pesticides, polychlorinated biphenyls (PCBs), and radioactive constituents. Results from 2006 show that elevated levels of mercury and PCBs continue to be present in fish tissue at all sampling locations. Laboratory results can be obtained from division Environmental Monitoring and Compliance personnel. Sampling oversight activities were conducted in May and June 2007, and results were not available as of the end of FY 2007.

### 3.4.7. White-Tailed Deer

Division personnel monitor results from the fall deer hunts conducted on the ORR. The annual deer hunts began in 1985 as a method of population control. The most prevalent contaminants found in the deer are cesium-137, a gamma emitter known to accumulate in body tissue, and strontium-90, a beta emitter known to accumulate in bone. Deer

are a bioindicator of the effectiveness of the overall environmental cleanup program. Three weekend hunts were conducted in 2006, on November 11–12, December 2–3, and December 16–17. Of 286 deer taken in the hunts, 2 (0.70 percent) were retained due to internal radiological contamination (see Table 1). Hunt data can be obtained from division Environmental Monitoring and Compliance personnel or online at <[www.ornl.gov/rmal/huntinfo.htm](http://www.ornl.gov/rmal/huntinfo.htm)>.

### 3.4.8. Canada Geese

In 1998, geese collected from ORNL were found to have contamination above the administrative release level of 5 picocuries per gram (pCi/g). The division initiated an off-site collection to ascertain whether contaminated geese were traveling off the reservation. To date, no contaminated geese have been found off the ORR. Past studies conducted by ORNL personnel have shown that a small proportion of Canada Geese residing at ORNL may become contaminated. Consequently, an annual goose roundup is conducted at ORNL, locations near ETTP and Y-12, and other sites on the ORR. Geese are collected and scanned to determine if they are contaminated by radionuclides and other hazardous contaminants. Since 1991, this has been a cooperative project between the Tennessee Wildlife Resources Agency, DOE, BMAP teams, and division staff.

The 2007 roundup was conducted June 27–28, with Canada Geese collected from five locations on and around the ORR and at Clark Center Park. None of the geese had levels of contamination above the administrative release limit of 5 pCi/g.

### 3.4.9. Wild Turkey

Two managed weekend wild turkey hunts on the ORR are open to the public annually. In 2007, turkey hunts were held on March 31–April 1 and April 14–15 (Table 2). No turkeys were retained due to internal radiological contamination. Three birds have been retained over the history of this monitoring project (one each in 1997, 2001, and 2005) due to elevated strontium readings. The administrative release criteria for strontium are 20 pCi/g for bone tissue and 5 pCi/g for whole body count.

**Table 1. Fall 2006 deer hunts.**

Bucks	128 (44.8%)
Does	158 (55.2%)
Total	286
Retained	2 (0.70%)
Heaviest Buck	186 lb (12 Points)
Most Points	15
Heaviest Doe	118 lb

**Table 2. 2007 Turkey Hunts**

Adult	12 (80%)
Juveniles	3 (20%)
Total	15
Retained	0
Heaviest	22.5 lb
Average Weight	18.3 lb
Longest Beard	10.8 in.
Average Beard Length	8.1 in.
Longest Spur	1.4 in.
Average Spur Length	0.84 in.

#### 3.4.10. Threatened and Endangered Species

Division personnel support the TDEC Division of Natural Heritage by evaluating threatened and endangered plant and animal species on the ORR. Field surveys are conducted and report documents are reviewed as needed. The division keeps an inventory of those plant and animal species that are on the state and EPA lists for surveillance.

### 3.5. RADIATION

Throughout its history DOE has engaged in activities that use and release radioactive materials. As described in Sections 3.1–3.4, the division's Radiological Monitoring and Oversight Program oversees sampling and performs independent monitoring for potential radioactive contamination in the air, soil and sediment, water, and biota. However, gamma radiation is unique in that it can be detected from a distance.

The division investigates the potential for public exposure to gamma radiation from DOE and contractor activities, including facility and material contamination. Following are descriptions of routine monitoring programs.

#### 3.5.1. Ambient Radiation Monitoring

The division conducts ambient radiation monitoring on the ORR using environmental dosimetry. Radiation is emitted by various radionuclides that have been produced, stored and disposed of on the ORR. This program provides conservative estimates of the dose to members of the public and to the environment from exposure to gamma and neutron radiation through the use of environmental thermoluminescent dosimeters (TLDs). Currently 141 TLDs have been placed in various locations.

Areas of concern noted by division monitoring are primarily in Melton Valley and include the Cesium Forest, Molten Salt Reactor Experiment, casks

stored at Solid Waste Storage Area 5, the Haw Ridge scrap site, and the White Oak Creek weir. These areas are not accessible by the public.

Otherwise, all other areas fall below the 100 mrem/year dose limit to members of the public specified by DOE Orders.

#### 3.5.2. Continuously Recording Gamma Exposure Rate Monitors

The division deploys continuously reading gamma exposure rate monitors to locations on the ORR where exposure rates are expected to fluctuate over relatively short periods of time. These monitors record gamma radiation levels at predetermined intervals over extended periods, providing an exposure rate profile that can be correlated with changing conditions.

This program is used to oversee DOE and DOE contractor activities and to ensure that the public is not put at risk by these activities. The highest rate, which was recorded at



View of division ambient realtime radiation monitor at the Molten Salt Reactor Experiment.



the Environmental Management Waste Management Facility (EMWMF), measured 8.9 mrem/hour.

### 3.5.3. Ambient Gamma Radiation Monitoring of the Uranium Hexafluoride Cylinder Yards at ETTP

This program monitors the potential dose to members of the public and the potential environmental impacts created by storage of the uranium hexafluoride (UF<sub>6</sub>) Cylinders at ETTP. Optical Stimulated Luminescent Dosimeters (Environmental TLDs) were staged around the perimeter of the cylinder yards to evaluate potential doses. These TLDs were collected quarterly and analyzed by Landauer. The results were calculated as a potential yearly dose by the state for reporting purposes.

During 2006, the division's Ambient Gamma Radiation Monitoring Program determined there was an elevated exposure potential to the public at two of the three remaining monitored cylinder yards.

The last cylinders of UF<sub>6</sub> were shipped to Portsmouth, Ohio, in December 2006 on schedule. This project was completed successfully with no transportation accidents for the more than 5,000 cylinders sent to the Portsmouth Gaseous Diffusion Plant for ultimate conversion of the material to a stable oxide form.

First quarter monitoring of the empty cylinder yards did not relay any readings over normal

expected background activity. A radiological survey around the perimeter of the empty yards also did not find elevated readings. No present risk to the public exists, and current results are protective to the public and the environment. Once the radiological boundary ropes are taken down by DOE, a thorough walkover survey will be conducted where the cylinders were stationed.

### 3.5.4. Facility Surveys

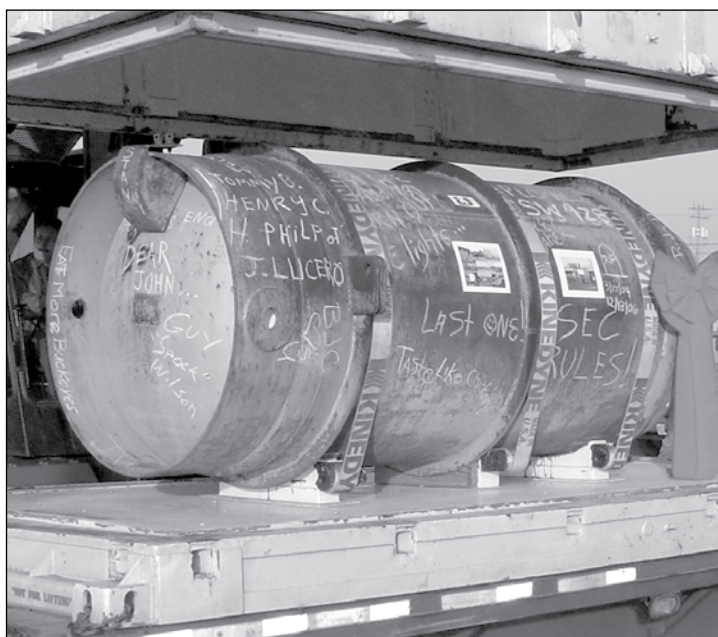
The division's Radiological Monitoring and Oversight Program conducts a Facility Survey

Program that characterizes facilities based on their physical condition, operational history, past contaminant release history, and radioactive and chemical inventories and estimates their potential for ongoing and future contaminant release to the environment. Program staff examine facilities and their surrounding footprints by making field visits using radiation monitoring instruments, conducting interviews, and

examining historical and working documents. The program has examined 183 facilities since 1994 and found that 69 held a high potential for negative environmental impact. Members of the public are not allowed access to buildings with significant contamination.

### 3.5.5. Road Surveys

The division conducts periodic walkover surveys of radiological waste haul roads located on the ORR. Currently the program consists of Reeves Road, which is used to haul waste from ORNL to



TEMA photo

The final shipment of overpacked UF<sub>6</sub> cylinders is readied to leave ETTP.

the EMWMF, and the Haul Road, which is used to carry waste from ETTP to the EMWMF. Other roads that are used occasionally, such as Lagoon Road, are surveyed as they are used.

A sodium iodide instrument that measures penetrating gamma radiation is used on the walkover survey, with other instruments on hand if the need arises. No contamination has been found on the roads to date (August 2007), and no suspect staining has been seen to warrant additional evaluations. The results indicate that no waste is leaking during transfer to the EMWMF and that there is no risk to the public or the environment from the transfer activities at present.

### 3.5.6. Verification of Surplus Materials Release

DOE conducts online and onsite auctions of surplus materials to the public. These materials range from furniture to shop equipment to vehicles. Staff from the division's Radiological Monitoring and Oversight Program review radiological control procedures to ensure that DOE and its contractors follow agreed-upon guidelines for release of these materials to the public. Division staff conduct random, onsite radiological surveys before these materials are auctioned. They also review and evaluate occurrence reports when radiologically contaminated materials are inadvertently released. Scrap metal sales and procedures for release are also monitored at ORNL and Y-12 under this program. During 2007 staff conducted ten surplus property inspections and found several items that were removed from auction sales because of suspect radioactivity. Staff will continue to monitor sales of surplus materials as long as they last.

### 3.5.7. EMWMF Liquid Effluent Monitoring

This program monitors the liquid effluents associated with the disposal of waste at the EMWMF by

DOE contractors. The program tests for radionuclides, both upstream of the disposal facility and where the effluents are released to the environment, as well as total suspended solids below the sediment basin. Radiological results were not above release limits.

Elevated levels of total suspended solids were collected twice over 18 months. Samples were collected for total suspended solids only if there was a visible problem. One sample from 2006 and one from 2007 were above the limit of 110 mg/L. The environment could be better protected by consistently keeping total suspended solid levels below limits.

Both public health and the environment are best protected by keeping radiological releases in effluents as low as reasonably achievable. Radiological results were not above release limits, but they were greater than twice background levels for multiple analyses (most consistently for gross beta). The limit is a release to the environment of 25 mrem/year.



Division staff monitor surplus DOE material prior to public sale.

The monitoring results have raised several concerns:

- The possibility that radiological contaminants in released effluents from EMWMF may be entering the groundwater;
- The issue of dilution, often via precipitation or other pumped stormwater, of the effluents released on site;
- The levels of total suspended solids in the effluent released from the sediment basin; and
- The issue of bioaccumulation of radionuclides in plant and animal life that come in contact with effluents from EMWMF on a regular basis.

## 4. Environmental Management

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### 4.1. ENVIRONMENTAL RESTORATION

#### 4.1.1. Status of FFA Projects

CERCLA-driven environmental cleanup at the ORR slowed during 2007. Most remedial actions were focused within ORNL's Melton Valley Watershed and at ETTP. DOE did complete all of the remedial actions described in the Record of Decision (ROD) for Melton Valley. While remedial actions continued at ETTP, the pace of cleanup was not enough to complete all remediation activities by 2008. Table 3 describes the status of all FFA projects worked during 2007.

#### 4.1.2. Accelerated Cleanup Plan

The Oak Ridge Accelerated Cleanup Plan agreed upon by the state, DOE, and EPA in June 2002 continues to be implemented. The objective was to shorten cleanup times throughout the reservation, with cleanup at ETTP to be complete in 2008, interim cleanup of Melton Valley to be complete in 2006, the disposal of all low-level legacy waste to be complete in 2005, and the CERCLA remedial actions across the reservation to be complete by 2016. The plan was meant primarily to reduce long-term cost and to expedite remediation of the most contaminated sites on the ORR. Much progress has been made after five years of work. The Melton Valley portion of the plan was completed early in FY 2007. The ETTP closure project is also under way, but the project is now behind schedule because of the overall complexity of the project and some unforeseen difficulties. With only one year remaining on the projected 2008 finish, it will not be possible to complete the closure of ETTP as planned. The state will continue to work with DOE to expedite ETTP remediation activities so that the 2016 end date can still be achieved.

#### 4.1.3. Federal Facility Agreement Dispute Resolution

During the past year the FFA parties were forced to resolve a formal dispute as prescribed by the FFA. This dispute involved the milestones in

Appendices E and J. Appendix E specifies the deadlines for important project achievements or document submittals within the next three years. These are "enforceable" milestones. Appendix J lists non-enforceable milestones projected beyond three years. The dispute, initiated by EPA and TDEC on December 05, 2007, concerned the following:

1. the inadequacy of Appendix E and Appendix J milestones proposed by DOE in September 2007,
2. DOE's failure to follow FFA procedures requiring DOE to determine the impact of the 2007 budget shortfall on existing Appendix E milestones, and
3. DOE's unilateral work stoppage on several FY 2007/2008 milestone projects.

The dispute was partially resolved in March 2008. However, several issues were not settled and were elevated to the Senior Executive Service level for resolution. The root cause of the dispute was the overall decrease in funding for the Oak Ridge Office's Environmental Management (EM) program, to which DOE responded by proposing FFA changes without using proper procedures.

#### 4.1.4. Uranium-233 Stabilization Project.

The ORNL Building 3019 complex serves as a storage facility for DOE's inventory of U-233. It is also the site chosen for downblending of U-233 into an attenuated form to satisfy broader safeguard and security requirements, eliminate long-term worker safety and criticality concerns, and allow it to be placed in safe storage to await future disposal. This action calls for considerable modification of the 3019 complex to accommodate new process equipment and operations. At the end of the U-233 processing, the building is to be left in a safe and stable shutdown mode to allow later D&D.

From the onset of the project in 2003, division staff have been involved with preplanning docu-

**Table 3. Status of all FFA projects worked during 2007**

Site	Project	Status
ORNL	Molten Salt Reactor Experiment	The ROD requires DOE to remove the molten salt from the fuel and flush tanks in the facility. DOE experienced numerous technical and safety issues during the year. The removal of U-233 was completed in FY 2008. Removal of the fuel salts is scheduled for completion in FY 2011.
	Melton Valley Watershed	DOE completed all fieldwork associated with the ROD. The final Remedial Action Report should be completed during FY 2008.
	Bethel Valley Watershed	The ROD was signed in 2002. Though remedial actions for this area have yet to begin, DOE has performed some preliminary studies that will expedite remediation once it begins. Bethel Valley is being managed under DOE's Balance of Program project, and cleanup is scheduled to start in the next few years. This site is the source of a known groundwater plume in Bethel Valley. Though DOE has removed approximately 90% of the contaminated soil around out-of-service underground tank W-1A, the most contaminated soil still remains. DOE should complete this project in FY 2010.
	Corehole 8 Source Removal	This site is the source of a known groundwater plume in Bethel Valley. Though DOE has removed approximately 90% of the contaminated soil around out-of-service underground tank W-1A, the most contaminated soil still remains. DOE should complete this project in FY 2010.
Y-12	Upper East Fork Poplar Creek Phase I ROD	The first action completed under this ROD, signed in 2002, was construction of a treatment plant to remove mercury from a spring in the creek. There are several source-control projects planned for the future, such as building demolition and work on the west end mercury spill area.
	Upper East Fork Poplar Creek Phase II ROD	This ROD was signed in 2006. Remedial actions focus primarily on contaminated soils and a large scrapyard. Actions from this ROD are scheduled after 2008.
	EMWMF	This ROD was signed in 1999. The project was the construction of an engineered disposal cell for waste generated by CERCLA cleanup on the ORR. Wastes that meet the waste acceptance criteria will be disposed at the 1.7 million-cubic-yard facility for the duration of the cleanup program.



**Table 3. Status of all FFA projects worked during 2007 (continued)**

Site	Project	Status
ETTP	ETTP Zone 1	The Zone 1 operable unit consists of approximately 1,400 acres outside of the main plant site. Regulators have agreed that 1,100 of those acres require no further action, based on dynamic verification strategy characterization that has been accomplished to date. Two actions required in the Zone 1 ROD were completed this year: the K-770 Scrapyard Removal Project and the K-710 Sludge Beds and Imhoff Tank Removal. Several soil removal actions remain to be completed.
	ETTP Zone 2	The Zone 2 operable unit consists of the approximately 800 acres that make up the main industrial area of ETTP. Approximately one quarter of the Zone 2 area has been characterized and results transmitted to regulators in the 2007 Zone 2 Phased Construction Completion Report. Several slabs remaining after D&D of buildings in the laboratory area were removed. Dynamic verification strategy characterization of the remainder of Zone 2 and the soil removal actions spelled out in the Zone 2 ROD remain to be completed.
	ETTP Sitewide	This project encompasses both Zone 1 and Zone 2, focusing on human health and ecological protection from surface water bodies, ecological protection from surface soil, and human health protection from groundwater. This year the sitewide remedial investigation/feasibility study was submitted to the regulators for review, and resolution of regulator comments is ongoing.
	K-29, K-31, and K-33 D&D	The Action Memorandum for this project was signed in 1997 and included equipment removal and building decontamination. Fieldwork was initiated in 1998. Equipment removal has been completed, but final decontamination of the K-31 and K-33 buildings is incomplete pending final disposition of the buildings.
	K-25/K-27 D&D	The Action Memorandum for this project was signed in 2002. Initially, D&D activities were broken down into three phases: removal of hazardous materials, removal of process equipment, and demolition of the building structure. As of June 2007, all three phases of activity were under way in Building K-25.
	Group II Buildings D&D	This project was initiated in FY 2000 and includes the demolition of all remaining aboveground structures at ETTP. In the last year, the following D&D projects were completed: K-1064 Facilities, Balance of Site Lab Facilities, Building K-29, and Building K-1420. Work is under way on the following projects: Building K-1401, Poplar Creek Facilities, Low Risk/Low Complexity Facilities, and Predominantly Uncontaminated Facilities.

ment reviews and comments. Staff will continue to follow the project via site visits, monthly contractor updates, and document reviews until the project is completed.

#### 4.1.5. Special and Emergency Projects

**Cesium-137 Casks.** Radiological detectors indicated high radiation levels inside a dump truck transferring solid waste from the K-770 scrap yard to the EMWMF in mid-October 2005.

Investigations revealed a broken metallic cask inside the truck bed, with radiation readings of 7 R/hour near contact. During late October and the first part of November two more casks were found in the scrap yard. Following the declaration of a Potential Inadequate Safety Analysis, all work at the K-770 scrap yard was temporarily suspended. In early December 2005 analytical results from detailed Nondestructive Assay tests indicated Cs-137 and Co-60 in the casks. Maximum readings approached 271,000 Curies. The origins of the casks are unknown. In late March 2006 the three casks were packaged in lead blankets, put in reinforced concrete vaults, and sent to ORNL 7822 Storage Pad for temporary storage. The casks will be stored at ORNL until funding becomes available for invasive testing and determination of final disposition. Division staff have tracked activity in this project since the finding of the first cask and will continue until disposition.

**Sodium Shields.** On May 8, 2004, subcontractors at ETTP began melting solid sodium contained in large aluminum canisters previously used as shielding. The liquid sodium was to be transferred from the 20,000-lb canisters to Department of Transportation-approved smaller containers and then dispositioned. As the sodium in the first canister was warming, it expanded and caused the alu-

minum canister to break open. The leaking liquid sodium also breached the secondary containment and came in contact with rainwater, resulting in an exothermic metal reaction and sodium fire. The ETTP fire department was immediately called to the incident scene. Later in the day the Emergency Operations Center activated, and field monitoring teams were dispatched to determine the nature and extent of the chemical release. Nearby residents were advised to evacuate. The sodium fire was allowed to continue until the reaction ceased. The remaining 100,000 lb of sodium was moved to a building at ETTP that provided covered storage. The sodium will remain stored in this building until it can be sold for reuse or declared a hazardous waste. Staff will continue to follow this project via site visits, contractor updates, and document reviews until the project is completed.

## 4.2. WASTE MANAGEMENT

### 4.2.1. Oak Ridge Environmental Management Waste Management Facility

Also known as the CERCLA waste disposal facility, the EMWMF was built to dispose of the large volumes of contaminated waste generated by remedial actions on the ORR, a formidable and expensive disposal problem.

DOE, EPA, members of the public, and the state—through the division's Environmental Restoration Program—took part in the planning and decision-making that authorized the facility. The EMWMF is now up and operating and has received waste from numerous projects on the ORR and from offsite cleanups that were DOE's responsibility.

Because of the long half lives and chemical hazards of the contaminants being disposed, the EMWMF will have to be maintained essentially forever. Tennessee has



TDEC photo  
A division staff member prepares to sample effluent from the EMWMF sedimentation pond.

established a trust fund to which DOE makes annual allotments. The state will use revenue generated from the fund to provide surveillance and maintenance after final closure of the EMWMF.

The division has been active in environmental oversight of the EMWMF. Staff participated in the core team during the design and construction of several projects. Due to higher-than-expected groundwater levels under Cells 2 and 3, a groundwater suppression system was designed and constructed at the EMWMF. Also, design and construction of Cells 3 and 4 were completed. The division will continue to provide environmental oversight of this facility, which is a high priority for the state.

#### **4.2.2. TSCA Incinerator**

This incinerator, located at ETTP, is designed to treat mixed waste and PCBs (“mixed” waste contains both radioactive and hazardous contamination). This is the only incinerator in the United States permitted to treat mixed waste contaminated with PCBs. With the shutdown of DOE incinerators in Idaho and South Carolina, Oak Ridge Operations’ TSCA Incinerator has become a unique treatment option. In support of accelerated cleanup plans across the DOE complex, the current strategy is for the incinerator to remain operational until 2009. The Commissioner has conditionally approved the TSCA Incinerator FY 2007–2009 Burn Plan to allow the division to assist DOE in better planning and scheduling resources for the facility. The division has and will continue to perform technical reviews of each waste stream in the burn plan to assure the timely and suitable throughput for the incinerator as well as compliance with applicable permits. The waste packages are thoroughly reviewed and commented on with the intent to accommodate waste for treatment and to prevent renewed accumulation of waste in Tennessee.

Before out-of-state waste is shipped to the TSCA Incinerator, the division performs a detailed review of waste characterization data; the review includes evaluation of the waste’s suitability for incineration, length of storage at the TSCA Incinerator prior to incineration, compatibility with other

waste streams in storage, and availability of burnable ORR waste. Data packages are also reviewed for radioactivity, metal concentrations, and compatibility of waste characteristics and then compared to the permit stipulations.

The division’s Waste Management Program oversaw incinerator operations in FY 2007. During the year, the state approved a modification to the incinerator’s permit incorporating the Maximum Achievable Control Technology provisions in formulating the feed rates. This facilitated the use of chlorinated solvents available in the DOE complex. DOE has requested a PCB demonstration test with feed rates higher than those at the trial burn. The review also focuses on a determination of whether incineration was the only treatment option for those out-of-state waste streams. The incinerator operated during FY 2007 in compliance with its permits.

The TSCA Incinerator treated 513,649 pounds of waste during FY 2007. The division continues to encourage DOE to fully characterize onsite waste inventories that could be potentially treated at the incinerator. The division has found in field audits waste stored on the ORR inventories that, if fully characterized, may meet TSCA acceptance for incineration.

#### **4.2.3. Oak Ridge Reservation Landfills**

The division, through its Waste Management Program, works to ensure that DOE adheres to provisions of RCRA and to the rules and regulations governing solid waste disposal in Tennessee.

The DOE landfills at Y-12 dispose of the ORR’s solid wastes, which must be non-radioactive and non-RCRA-regulated. DOE must use approved operations in receiving, compacting, and covering waste. The division audits DOE landfills on the ORR monthly. It also reviews DOE practices to ensure that radioactive waste is not disposed in these landfills.

Reviewing the three remaining ORR landfills in FY 2007, Landfill IV received 90 cubic yards of waste, Landfill V received 27,601 cubic yard, and Landfill VII received 76,442 cubic yards. All land-

fills were found to be operating in full compliance with their permits.

#### **4.2.4. Hazardous Waste Management**

Division staff participated in FY 2007 RCRA annual compliance inspections at ORNL, Y-12, and ETTP. The inspections found no violations during these inspections, although the state and DOE were working to resolve violations from the FY 2006 inspections.

ORNL applied for and received inclusion in EPA's Performance Track Program. Under the program, ORNL is allowed to store waste for 180 days rather than the 90 days previously allowed. Additionally, the Transuranic (TRU) Waste Processing Center is now included under ORNL's RCRA permit rather than being under a separate RCRA permit.

#### **4.2.5. Radioactive Waste Management**

**Legacy Low-Level Radioactive Waste.** Under the Oak Ridge Accelerated Cleanup Plan, DOE was to dispose of all its more than 32,000 cubic meters of legacy low-level waste by the end of FY 2005. ("Legacy" waste refers to waste that was in DOE EM program inventories prior to September 30, 2000.) By June 2006, most had been disposed of, with two notable exceptions: waste streams for which there is no treatment capacity and a small portion of the waste for which DOE has given its EM contractor a contractual extension. This inventory, 334 cubic meters, was to have been disposed of before the beginning of FY 2007, but it has been postponed until the 2010–2011 timeframe.

"Grandfathered waste" is a special category of legacy low-level waste at Y-12. It was certified to earlier waste handling requirements and must be further characterized and sorted to meet waste acceptance criteria at current disposal facilities. The EM program accepted no additional grandfathered waste after FY 2004. Some of the 3,282 cubic meters of grandfathered waste remaining at Y-12 has been incorporated in a security barrier around the exclusion area of the plant. The waste in this barrier will not be dealt with until after

2010, when a new protected area currently under construction is expected to be functional. The remainder of the waste will be dispositioned as funds become available. Because of the high cost of characterization and sorting and segregating, current funding will not be enough to significantly reduce the storage of grandfathered waste. DOE must find an administrative pathway for the characterization and disposition of Y-12's legacy low-level waste.

**Newly Generated Low-Level Radioactive Waste.** The "newly generated" category contains low-level waste generated since October 1, 2000. By the end of FY 2007, the DOE EM program's inventory of this waste stood at 3,665 cubic meters. Based on the latest DOE project prioritization, none of the waste in this category will be disposed of, and the inventory will continue to grow until 2011–2012. However, DOE's National Nuclear Security Agency (NNSA) has been assigned responsibility for its own newly generated waste and has instituted an active waste disposal program at Y-12.

#### **4.2.6. Mixed Waste Site Treatment Plan**

The Site Treatment Plan is a mixed-waste management tool authorized through the Federal Facility Compliance Act. DOE continues to treat, store, and dispose its mixed wastes (i.e., wastes that have both hazardous and radiological constituents). The Site Treatment Plan is implemented through a TDEC Commissioner's Order because the hazardous constituents are regulated. This enforceability has usually resulted in an effective work-off of inventories according to negotiated schedules.

Most of the remaining inventories of DOE's mixed waste under the Site Treatment Plan consist of Mixed TRU and Broad Spectrum Contract waste streams. Mixed TRU waste requires special handling, packaging, and disposal in geologic repositories because it has a long half-life and other radioactive properties.

Broad spectrum waste includes a variety of low-level and hazardous wastes from DOE's past operations that were designated for treatment by the private sector. Waste streams in this category are listed in the Site Treatment Plan.



**Mixed Transuranic Waste.** Mixed TRU waste at ORNL requires processing before the TRU waste can be disposed at the Waste Isolation Pilot Plant in New Mexico and the mixed low-level waste at the Nevada Test Site. On April 12, 2007, the commissioner of TDEC resolved a formal dispute over the state's jurisdiction regarding mixed TRU wastes. The commissioner determined that uncharacterized and unprocessed mixed waste inventories stored on the ORR—and referred to as the Site Treatment Plan mixed TRU waste streams—are subject to RCRA as amended by the Federal Facility Compliance Act. The commissioner's letter established milestones and targets for processing mixed TRU waste held on the ORR. Consequently, DOE initiated negotiations of these milestones and proposed its own processing rates. While the negotiations continue, TDEC would like to see the processing rates accelerated in order to ensure disposition of mixed low-level waste at the Nevada Test Site before it is closed to out-of-state mixed wastes in 2010.

**Broad Spectrum Waste.** Throughout FY 2007 TDEC and DOE worked to resolve an informal dispute over missed disposition milestones for the broad spectrum waste. Attempts to improve the reporting and tracking of broad spectrum waste characterization and disposition resulted in revision of language in Site Treatment Plan reports for waste additions, transfer, or reassignment and the separate tracking for Site Treatment Plan waste stored at Y-12. Overall, in FY 2007, the DOE EM program accomplished little or no disposition of mixed waste while NNSA continued to dispose Y-12's mixed waste at a steady rate. As of the end of FY 2007, approximately 225,000 lb of waste as specified in the Site Treatment Plan remain to be shipped for treatment and disposal by the EM program. Y-12 has approximately 28,000 lb remaining.

#### 4.2.7. Water Pollution Control

**National Pollutant Discharge Elimination System (NPDES) Compliance.** Division staff oversaw various aspects of the ORR wastewater treatment facilities' operations, their radiological effluents, their potential impacts to water quality

both on and off the ORR, and their possible impacts to human health and the environment. Staff reviewed monthly discharge monitoring reports for reported noncompliance with NPDES permits at ETTP, ORNL, and Y-12. The TDEC Division of Water Pollution Control holds the official copies of these permits. Radiological NPDES data, reported in discharge monitoring reports, was periodically reviewed and evaluated to determine the effectiveness of DOE's water pollution control program. In June 2006, a sample with 1,100 picocuries per liter (pCi/L) curium-243/244 (about 20 times the concentration specified in the Ingested Water Derived Concentration Guideline) was taken from Outfall 080 at ORNL near the Molten Salt Reactor Experiment. The material appears to have been released during a remedial action involving grouting of pipes that once carried waste from the Radiological Engineering Development Center. DOE issued a fact sheet in May 2007, presenting the known background of this source and its probable fate and transport. The report concluded that the contamination is diluted near the source and has minimal effect on the receiving stream. An evaluation of potential risk concluded that for recreational exposure this was well below levels of concern. Outfall 080 has intermittent flow, and only five samples have been collected in the past year due to low discharge from this outfall. The last sample collected in April 2007 contained 290 pCi/L curium-243/244. While nearly six times the Derived Concentration Guideline, this result may indicate that the released material is washing out of the subsurface. While this outfall is of a concern due to elevated levels of contamination, its potential impact to the public is low due to its location on the ORR.

NPDES activities for FY 2007 also included the following:

- Division staff worked with DOE and the Division of Water Pollution Control concerning the renewal of ORNL's NPDES permit.
- Y-12 continued the formal appeal of a number of terms set forth in a new permit issued in May 2006. The division participated in discussions with DOE and state regulators.

- Several modifications and upgrades were made to ORR wastewater treatment systems. At ETTP, the transition from the Central Neutralization Facility to a new wastewater treatment system at the TSCA Incinerator complex began. During the CERCLA demolition of Building 1401, sump water from the basement was treated at the ETTP sewage treatment plant. At Y-12, upgrades to the dechlorination system were installed. Acceptance testing of the new system is under way.

- Plans for the construction of a Science and Technology Park at ORNL highlight the continuing trend of private sector development on ORR land. The reuse of property introduces complex relationships between owners, developers, and leasers. Division staff coordinated meetings to assure regulatory compliance and protection of the environment in this new approach to redevelopment.

- There were several reportable occurrences at ETTP's storm water outfall 170. In March 2007, elevated pH levels were traced to D&D activities at Building 1501. In June 2007, elevated levels of chromium were detected at the outfall and nearby in Mitchell Branch. These elevated levels, together with elevated levels of radioactivity and volatile organics, were measured following the demolition of Building K-1420 and subsequent discontinuation of sump water treatment. The state continues to discuss with DOE options to mitigate chromium discharge to waters of the state and DOE's efforts to locate the source of chromium contamination.

- Division staff continued to monitor mercury levels in East Fork Poplar Creek at Station 17, which is at the Y-12 boundary. A 1999 TDEC consent order mandates management of mercury concentrations in East Fork Poplar Creek. The new NPDES permit changed DOE's reporting format from the 3-month running average mercury concentration in grams per day to an average concentration presented as milligrams per liter. The May 2007 mercury concentration was reported as  $< 0.00022$  mg/L, which was calculated by the division's staff to be equivalent to 6.08 g/day. This is the lowest mercury concentration recorded at Station 17 to date, with

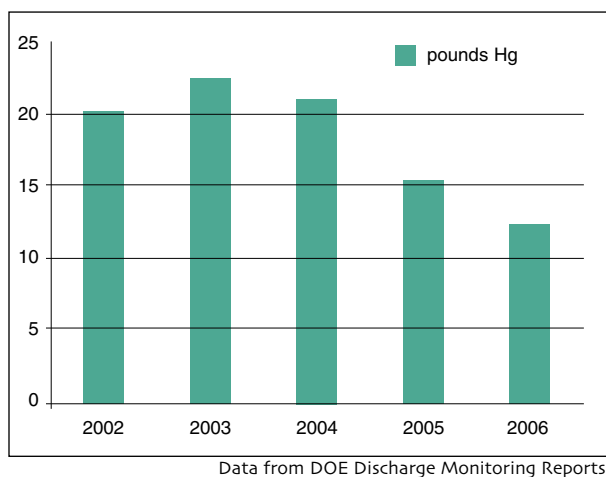


Figure 3. Mercury released through Station 17.

progress apparently the direct result of a mercury treatment unit installed as a CERCLA remedy at Outfall 051 (Big Springs). Although DOE has still been unable to achieve an interim guideline of 5 g/day in-stream mercury concentration, the reported improvement is encouraging. Division staff continue to evaluate all available mercury data. Mercury dis-

charges from the Y-12 site into East Fork Poplar Creek for the past 5 calendar years are illustrated in Figure 3.

#### Aquatic Resource Alteration Permits and

**Wetlands Protection.** The division assisted DOE and the state Water Pollution Control Division, Knoxville Environmental Field Office, in reviewing aquatic resource alteration permits for construction and maintenance projects on the ORR. The division's involvement and recommendations, including site visits and CERCLA documentation review, facilitated and streamlined permitting decisions. The Water Pollution Control Division holds the official copies of the permits.

In FY 2007, division staff inspected erosion and sediment control practices at various sites on the ORR. At Y-12, this included installation of a new dechlorination system and renovation of a flume located on Bear Creek. Plans were reviewed for directional drilling beneath the Clinch River for a sewer line from Rarity Ridge to the sewage treatment plant at ETTP. The division's staff continued the oversight of the ongoing ORR fire roads upgrade project.

**Toxicity Biomonitoring.** DOE performs toxicity testing of final effluents from waste treatment facilities in accordance with its NPDES permits. Testing for survival and growth of test organisms is conducted to determine what impacts, if any, DOE discharges may have on aquatic life in the various receiving streams on the ORR. The division continued evaluation of DOE's self-monitoring program results, which are published annually in the DOE ORR Annual Site Environmental Report and reported in discharge monitoring reports.

DOE reports confirmed that DOE wastewater treatment effluents during FY 2007 were not toxic according to the requirements of state-issued NPDES permits.

#### **4.2.8. Air Pollution Control**

**Review of Permitted Air Emissions Sources.** The division conducted periodic reviews of air permitting documentation for ETTP, ORNL, and Y-12. Division staff assisted with the file review for the annual TDEC Division of Air Pollution Control inspection at ETTP.

**Oversight of Asbestos Management and Removal.** The division continued oversight of asbestos management and removal on the ORR. The reviews and site visits conducted by division staff confirmed DOE's compliance with air pollution control and solid waste management regulations.

#### **4.2.9. Decontamination & Decommissioning**

**Y-12.** The Y-12 complex is being modernized through extensive reuse of existing facilities, construction of necessary new facilities, and removal of infrastructure no longer required for Y-12 missions. The initial goal to reduce the Y-12 infrastructure footprint by 500,000 square feet was achieved at the end of FY 2002. In the next four years Y-12 reduced this footprint by an additional 1.73 million square feet. Division staff oversee the demolition of buildings to assure proper removal and disposition of hazardous and TSCA-regulated materials. This is a multimedia approach that includes assuring limited fugitive emissions and protecting waters of the state by isolating and protecting storm drains. NNSA has performed conscientiously to ensure all asbestos and other hazardous materials are removed from the buildings prior to demolition.

**ORNL.** During FY 2007 a number of small structures were removed from ORNL, and work was begun on the old cafeteria, Building 2010. Site visits performed by division staff documented practices that were compliant with applicable regulations.

#### **4.2.10. Transuranic Waste Processing**

Due to uncertainties in cost and timing of treating ORR TRU wastes, DOE assumed ownership of the TRU Waste Processing Facility, which was originally built under a privatization initiative. During the state's 2007 fiscal year, the TRU Waste Processing Facility began processing and shipping mixed low-level waste to the Nevada Test Site. As of the end of FY 2007, 163 55-gallon drum equivalents of mixed low-level radioactive waste have been shipped. DOE initiated preparations for the processing of remotely handled TRU debris, with the actual processing targeted to begin in 2008. As of the end of FY 2007, waste shipments of Oak Ridge TRU waste to the Waste Isolation Pilot Plant in New Mexico have not yet taken place.

## 5. Emergency Management and Response

### 5.1. EMERGENCY MANAGEMENT

In FY 2007, the division worked closely with DOE, TEMA, numerous other state agencies, and local governments to conduct a variety of emergency management-related activities.

Division staff served on the ETTP Exercise Executive Committee and participated in planning the 2006 ETTP series of exercises. The division operated the Environmental Monitoring Control Center at TEMA East during these exercises, staffed field monitoring teams, provided a technical adviser for the DOE Joint Information Center, and provided the TDEC lead for the Field Coordination Center at TEMA East. Division staff also performed the following emergency management activities:

- Acted as a member of the 2006 DOE Emergency Management Forum Steering Committee,
- Tracked and investigated (when appropriate) occurrence reports,
- Acted as a member of the Knoxville/Knox County Local Emergency Planning Committee,
- Attended monthly TEMA emergency services coordinator meetings,
- Acted as a member of the 2006 Radiological Assistance Program's Atomic Junction Steering Committee,
- Participated in the three-day Atomic Junction exercise in Clinton,
- Trained in disaster services with the American Red Cross,
- Trained in the use of WebEOC and EmIns (web-based emergency information systems),

- Participated in the DOE Emergency Public Information project,
- Oversaw the movement of sodium shields into safe storage at ETTP,
- Compiled the Continuity of Operations Plan for the division in the event of an emergency,
- Worked with the Civil Air Patrol and other agencies to obtain airborne radiation monitoring capability,
- Assessed the safety and condition of facilities on site through the division's facility survey program, and
- Completed tracking of the shipment of UF<sub>6</sub> cylinders to Portsmouth, Ohio.



Knoxville News Sentinel photo

DOE completed its shipping campaign for UF<sub>6</sub> cylinders safely without any accidents.

### 5.2. EMERGENCY RESPONSE

There were no incidents on the ORR requiring emergency response during FY 2007.



## 6. Key Challenges

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Most of the key challenges facing DOE, the division and the community are associated with DOE's cleanup program (Sections 6.2–6.4). This is only a portion of the mission that the division undertakes. In general, the division's environmental monitoring activities and its oversight of similar activities by DOE and its contractors indicate that there is no immediate significant risk to human health and the environment from historical and current releases of radioactive and hazardous substances on the ORR.

DOE, EPA Region 4, and the state signed an Oak Ridge Accelerated Cleanup Plan Agreement in 2002. The accelerated cleanup program was intended to complete the closure of ETTP, undertake interim actions in Melton Valley to cap historical disposal sites and control the spread of contamination in the groundwater, and complete other high-risk projects on and off the ORR by 2008. The plan called for all stored legacy waste from the Oak Ridge site to be disposed by 2005 and CERCLA cleanup at Oak Ridge to be completed by 2016. If this plan is successful, it will reduce cost by an estimated \$2 billion-plus and accelerate completion of the EM program by 5 years. Adequate annual funding is imperative to achieving agreed goals. The shortfall in the EM budget in FY 2007 has severely hampered the schedule for cleanup of the ORR. Although there is a schedule for completing active cleanup by 2016, the increase in EM budget required to meet this date is not likely given historical funding levels for activities on the ORR.

Currently, DOE is pursuing development of the Integrated Facilities Disposition Project. If this plan is approved, completion of cleanup activities on the ORR will be extended past 2020. This extension in the schedule will mean appropriate funding levels are more likely to be achieved.

### 6.1. CHARACTERIZATION AND DISPOSAL OF RADIOACTIVE WASTE

One obstacle to completing accelerated cleanup of the ORR is the characterization and disposal of

stored radioactive waste, which DOE self-regulates. This waste is physically in the way of cleanup activities. While DOE has largely completed disposal of its legacy low-level radioactive waste under the Comprehensive Waste Disposition Plan, DOE's current priorities have resulted in renewed accumulation of newly generated low-level waste. DOE is not providing sufficient funding to expeditiously characterize and dispose of low-level waste being generated by ongoing operations.

### 6.2. GROUNDWATER MANAGEMENT STRATEGIES

The CERCLA remedial action strategy at Oak Ridge is to make cleanup decisions on sources of contaminants before addressing groundwater. Sources may be burial grounds, spill sites, leaking tanks, contaminated soils, etc. It is a valid approach to determine whether source remediation significantly affects groundwater contamination, and this strategy is reflected in the types of RODs that have been approved over the past decade. However, a difficult decision is left for the future: What is to be done about contaminated groundwater?

Because of the complex geology and hydrology of the Oak Ridge site, the cleanup of contaminated groundwater is a daunting task. The present strategy is to attack sources first, and then institute groundwater remedies specific to individual problems. In some cases, groundwater can be remediated using traditional methods; in other cases, new technologies will be needed. However, some problems may not have definitive solutions by the time decisions must be made. Some remedies may take many years to return groundwater to a safe, usable condition. All potential scenarios short of total remediation require that DOE have adequate long-term stewardship and institutional controls in place to assure continued protectiveness to the environment and human health. An example is the findings that the Melton Valley picket wells are apparently contaminated by past DOE operations. This

raises a concern that the exit pathway from that part of the ORR is now inadequately monitored. Deep groundwater monitoring needs to be put in place beyond the edge of this contamination plume in order to protect domestic water supplies that rely on groundwater. The potential for deep groundwater to cross underneath the Clinch River (instead of rising and discharging to it) needs to be properly investigated, as that is the most likely route for deep contamination to impact water supplies off the ORR.

### **6.3. LONG-TERM STEWARDSHIP RESPONSIBILITIES**

Contamination, both hazardous and radioactive, will remain on the ORR for many years, long after the cleanup program has come to a close. As a result, long-term risk to the public and the environment will remain unless active care and monitoring of this contamination is maintained. The state is requiring that DOE ensure adequate funding for this care, independent of annual appropriations from Congress. If it is to be effective, long-term stewardship must also be accompanied by improvements in record keeping, enforcement, surveillance, maintenance, monitoring, and funding.

At Oak Ridge, there will be continuing missions by DOE's Office of Science and the NNSA. Both entities will have stewardship responsibilities for sites on their property, while closure sites will be managed by DOE's Office of Legacy

Management. DOE must ensure that these offices have effective support for the long-term stewardship activities that are not otherwise part of their missions.

### **6.4. THE FEDERAL COMMITMENT**

DOE continues to implement the Oak Ridge Accelerated Cleanup Plan. Results to date include significant D&D progress at ETTP, disposal of nearly all stored legacy waste, offsite disposition of 5,000 cylinders of depleted UF<sub>6</sub>, and pending completion of the activities in Melton Valley.

Although the Accelerated Cleanup Plan was signed by DOE, EPA Region 4, and the state, and the milestones were placed in the FFA, DOE has not provided sufficient funding to meet the scheduled goals, causing formal disputes with the state regarding DOE's ability to meet its milestones. The state expects continuing problems with DOE providing sufficient funding to Oak Ridge for the foreseeable future. This will result in delays and increased costs.

In addition to the planned EM work, there are approximately 200 contaminated and decrepit buildings at Y-12 and ORNL that must be demolished to make way for new facilities and to eliminate maintenance costs. The proposed program for D&D of these facilities is the Integrated Facility Disposition Project. DOE has not yet committed to funding this program.



TDEC photo

Ginseng is found on the Oak Ridge Reservation.

## 7. Outreach

### 7.1. TDEC DOE OVERSIGHT DIVISION

The division conducts public outreach at the local, state, and national levels, providing information to help the public understand both the ORR's environment and the impact of DOE operations. The division also maintains a Web site with detailed information about ORR environmental issues at <[www.tennessee.gov/environment/doeo/index.shtml](http://www.tennessee.gov/environment/doeo/index.shtml)>.

Other community organizations that monitor DOE activities in Oak Ridge also seek to include the public in their work. In addition, DOE has an extensive outreach program to solicit public input on environmental concerns, and the agency has established an information center to give stakeholders direct access to relevant documents.

Outreach programs enable the public to play a meaningful role in environmental decision-making. Following are the major public outreach efforts undertaken by a variety of organizations concerned with DOE's EM program at Oak Ridge. Contacts for local and state initiatives—including addresses, phone and fax numbers, and Web sites—are listed in the appendix.

#### 7.1.1. Local and Regional Activities

As part of an independent activity the division performs several public outreach efforts. These efforts include financial support of the Oak Ridge Reservation Local Oversight Committee (LOC) and its Citizens' Advisory Panel (CAP), membership on the Oak Ridge Site Specific Advisory Board, and attendance and participation with

exhibits at various events in Oak Ridge. The division also provides speakers for schools and citizen groups when requested.

During FY 2007 division staff assisted with the judging of science fair projects at Knoxville middle schools West Valley and St. John Newman.

Division staff also presented exhibits and dis-

cussed monitoring of the ORR at an Earth Day Festival hosted by a local church and at the annual Secret City Festival. During these events staff disseminated information about the division's role and monitoring on the reservation.

The division works with the following local and regional

organizations on issues associated with the ORR:

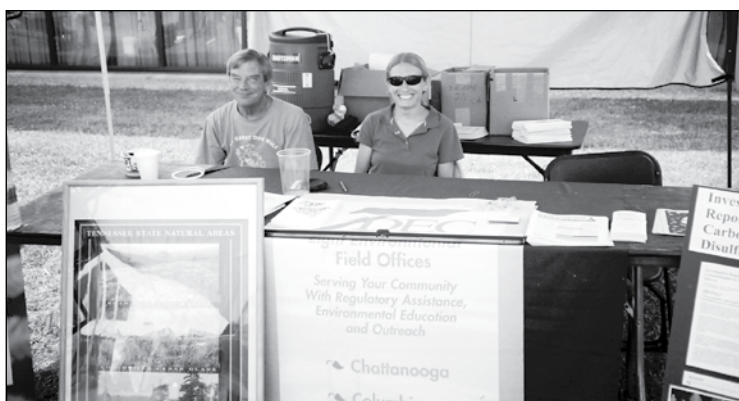
- Watts Bar Interagency Group (see sidebar)
- Tri-State Depleted UF<sub>6</sub> Working Group
- Local Oversight Committee
- Oak Ridge Site Specific Advisory Board

#### 7.1.2. National Activities

At the national level, division staff participate in a wide range of initiatives that affect the ORR, the Oak Ridge community, or the state. These initiatives include involvement in the following groups:

##### **Interstate Technology and Regulatory Council.**

The council was formed in 1995 as a multi-state coalition working to achieve regulatory acceptance of innovative environmental technologies. The state-led council became affiliated with the Environmental Council of States in 1999 and has been working closely with that organization to promote the examination of innovative technology



Division staff at the TDEC information booth at the Secret City Festival.

TDEC photo

### **WATTS BAR WORKING GROUP**

The Watts Bar Interagency Working Group Agreement allows federal and state agencies to coordinate their review of activities at Watts Bar Reservoir, specifically those that may disturb sediments that have been or may have been contaminated by DOE releases in Oak Ridge. In particular, the agreement looks to permitting and other use authorization by the U.S. Army Corps of Engineers and TVA, with these agencies reviewing proposed activities with DOE, TDEC, and EPA. The agreement does not limit the authority of any of these agencies; instead, it allows the group to collect and review relevant data and make a joint recommendation to the permitting agencies for consideration during the permitting decision.

that would lead to more cost-effective and efficient site cleanups. The division has a representative on the Radionuclides Team. The team published Real-Time Measurement of Radionuclides in Soil: Technology and Case Studies in February 2006 and developed an internet training session for release in November 2006. Currently the team is developing another document dealing with the D&D of radionuclide-contaminated DOE sites.

**The National Governors Association Federal Facilities Task Force.** The task force is composed of governor-appointed policy and technical representatives from states hosting major DOE facilities. Task force members work collaboratively with DOE officials on technical, economic, and political challenges, including budget and regulatory issues, waste treatment and disposal options, and equitable decisions on waste management.

**The National Conference of State Legislatures' State and Tribal Government Working Group.** The working group is a forum in which all tribes affected by DOE sites can interact directly with the states and DOE. The working group helps ensure that DOE facilities are operated and cleaned up in compliance with all applicable federal and state

laws and regulations and tribal rights. These rights include those retained by treaty and conferred by statute and the trust responsibility. Remedies must also protect human health, safety, and the environment.

**Intergovernmental Meeting with DOE.** The Energy Communities Alliance, Environmental Council of the States, National Association of Attorneys General, National Governors Association, and State and Tribal Government Working Group meet annually with DOE. The meeting provides an opportunity for senior DOE officials to talk with these groups collectively. It also allows the groups to coordinate on issues involving operation and cleanup of the DOE Complex.

**The Association of State and Territorial Solid Waste Management Officials Radiation Task Force.** This organization tracks radiation-related issues that could affect states. The group emphasizes federal facility issues and has cooperative projects with the Council of Radiation Program Directors, the Health Physics Society, and the American National Standards Institute.

**The Tri-State (Tennessee, Kentucky, and Ohio)/DOE Depleted Uranium Hexafluoride Working Group.** This group has worked on UF<sub>6</sub> management and transportation issues since 1997. Representatives had weekly conference calls to coordinate transportation of depleted UF<sub>6</sub> cylinders from Oak Ridge to the Portsmouth Gaseous Diffusion Plant. The shipment campaign was completed during FY 2007.

### **7.2. OAK RIDGE RESERVATION LOCAL OVERSIGHT COMMITTEE**

Representatives from the division participate in meetings of the LOC, an organization chartered under the TOA. The LOC's mission is to ensure that the best interests of member communities are protected and that public funds are used wisely during cleanup, continued operation, and reindustrialization at the ORR. The LOC is governed by a board of directors, which includes local elected and appointed officials from the city of Oak Ridge and the counties of Anderson, Roane, Knox,



Loudon, Meigs, Rhea and Morgan. Board members are concerned with human health and the environment, emergency management, and impacts on their communities' economic and social well being.

The board is advised by a 20-member CAP, which was created in early 1995 to provide advice based on in-depth reviews of DOE documents and studies of community concerns. CAP meetings often begin with presentations by experts on issues of current interest to the greater Oak Ridge community.

CAP members attend meetings of other organizations concerned with environmental, economic, and health issues in order to better evaluate the range of stakeholder opinions. The CAP regularly transmits public concerns to the LOC Board and to DOE, EPA, and various divisions within TDEC.

In the past year, issues addressed by the LOC and the CAP have included the following:

- The EM budget process and its implications for cleanup on the ORR,

- Accelerated cleanup impacts on future land use and reindustrialization,
- Planning for the Integrated Facilities Disposition Project,
- Community concerns over long-term stewardship of remediated sites,
- D&D and remediation decisions at ETTP, with emphasis on problems encountered on the K-25/K-27 project,
- Historic preservation on the ORR and its integration with cleanup planning and activities,
- Capacity and use of the CERCLA waste disposal facility for various cleanup wastes,
- U-233 stabilization and Building 3019 complex shutdown at ORNL,
- NEPA documents related to a variety of federal actions on the ORR,
- Waste management and air and water discharge permits for ORR facilities,



LOC photo

The LOC's Citizens' Advisory Panel is composed of area residents who study and provide feedback on DOE environmental and related issues affecting the Oak Ridge region.

- Political issues related to the decision-making process for waste disposal, especially remote-handled TRU waste, and
- Review of circumstances and emergency response efforts for incidents and exercises in FY 2007.

The LOC's outreach efforts include presentations to community groups and governmental entities, an e-mail news list, and an internet presence at <[www.local-oversight.org](http://www.local-oversight.org)>. The LOC is staffed by an executive director and an administrative assistant. For further information about the LOC or to be added to the e-mail news list, contact Susan Gawarecki in Oak Ridge by phone at (865) 483-1333, toll free at (888) 770-3073, or by e-mail at <[loc@icx.net](mailto:loc@icx.net)>. Meetings of the CAP and LOC Board are announced in the newspaper and are open to the public.

### **7.3. LOCAL GOVERNMENT ENVIRONMENTAL BOARDS**

#### **7.3.1. Oak Ridge Environmental Quality Advisory Board**

The Oak Ridge Environmental Quality Advisory Board is an official board of the City of Oak Ridge. Its members are appointed by the City Council, and the board, in turn, advises the City Council on environmental issues. Because the ORR is largely within the city limits of Oak Ridge, one of the board's primary functions is to review and comment on DOE cleanup activities that potentially affect the city. Information about the board's mission, members, and activities may be found at the City of Oak Ridge Web site <[www.cortn.org](http://www.cortn.org)>.

#### **7.3.2. Roane County Environmental Review Board**

Members of this official Roane County governmental board are appointed by the county executive and confirmed by the County Commission. The board advises both the county executive and the commission on environmental matters, including those resulting from the presence of two major ORR facilities—ORNL and ETTP—in Roane

County. Information about the board's membership and meetings may be found at the Roane County Web site <<http://roanegov.org/index.html>>.

Roane County continues to attract commercial waste management firms interested in doing business with DOE and outside clients. In addition, three incinerators on or near the ORR are situated within county boundaries. The east end of Roane County will have a variety of DOE-related cleanup, waste management and transportation issues to monitor for years to come.

### **7.4. DOE PUBLIC INVOLVEMENT**

DOE works with TDEC and EPA to foster public involvement in environmental remediation decision-making. Opportunities may include informal conversations, electronic communications, scheduled meetings and workshops, legally required permit hearings, and stakeholder advisory groups.

Some portions of DOE's public involvement program are required under CERCLA and specified in the FFA. A Public Involvement Plan, updated every 3 years, is one example.

#### **7.4.1. Public Involvement and Outreach**

DOE's Community Relations office produces two publications distributed to interested individuals. The monthly Public Involvement News summarizes upcoming public meetings, announcements, availability of documents, pending NEPA actions, and opportunities for public involvement. Cleanup Progress is an annual report highlighting DOE's EM activities and decisions of the preceding fiscal year. It also fulfills the annual regulatory reporting requirement under the FFA. Individuals can be added to the Community Relations mailing list by calling (865) 576-0885, or they can pick up a copy of either publication at the DOE Information Center (see appendix).

EM activities are also detailed on the internet at <[www.oakridge.doe.gov](http://www.oakridge.doe.gov)> under "Programs" and at <[www.bechteljacobs.com](http://www.bechteljacobs.com)>, which provides links to public documents, meeting and event calendars, and other information sources.

#### **7.4.2. Oak Ridge Site Specific Advisory Board**

The Oak Ridge Site Specific Advisory Board is an advisory committee to DOE's EM organization and is chartered under the Federal Advisory Committee Act of 1972.

The board provides advice to DOE's Oak Ridge EM program both on policy issues and on specific decision documents. The board consists of up to 20 members from the greater Oak Ridge region who are concerned about environmental restoration and waste management. Representatives from TDEC, DOE, and EPA Region 4 attend meetings as non-voting members to act as a resource for information and to hear concerns of the board. The board's standing committees are Environmental Management and Stewardship.

All board and committee meetings are open to the public and are announced in newspaper advertisements, in the Federal Register, and at the Information Resource Center in Oak Ridge. Board meetings are recorded on video, and copies of the tapes are available for public review. The board produces a quarterly newsletter called "The Advocate," and its Web site is at [www.oakridge.doe.gov/em/ssab/](http://www.oakridge.doe.gov/em/ssab/). Information is also available by calling the board's support office (see appendix).

#### **7.4.3. National Environmental Policy Act**

NEPA requires federal agencies to provide public officials and citizens with environmental information for proposed federal actions that could affect environmental quality. This is accomplished through the preparation of one of two documents: an environmental impact statement if the proposed action will have a significant impact on environmental quality, or an environmental assessment if

the impact is not significant. The environmental impact statement requires public involvement and access to information regarding DOE proposals. Formal public meetings are held in conjunction with the scoping and release of an environmental impact statement, giving regulators and citizens an opportunity to comment openly on DOE's planned activities.

In 1994, DOE adopted a policy that combines the public involvement procedures of NEPA and CERCLA for major cleanup decisions. This policy states, "CERCLA documents will incorporate NEPA values, such as analysis of cumulative, off-site, ecological, and socioeconomic impacts, to the extent practicable." DOE's policy and announcements on pending NEPA actions are available on its Web site at <http://www.eh.doe.gov/nepa/>.

#### **7.4.4. DOE Information Center**

The DOE Information Center is the repository for all publicly available material about DOE's Oak Ridge Operations. The Information Center, located at 475 Oak Ridge Turnpike, is also the official repository for all information and documents that support or compose the administrative record for the FFA. This includes such information as newspaper articles related to the ORR, official correspondence, and decision documents on site remediations. It is also the storage area for documents requested under the Freedom of Information Act, newly released or declassified files and information dealing with health issues, and documents covering all aspects of the ORR's environment not otherwise part of the administrative record.

These files are accessible to the public with certain restrictions and may be read on the premises, or the staff will copy documents on request. The Information Center's phone number is (865) 241-4780.

# Appendix

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## **LOCAL GOVERNMENT AND STAKEHOLDER ORGANIZATIONS**

### **The Oak Ridge Reservation Local Oversight Committee, Inc. (LOC)**

Susan Gawarecki, Executive Director  
102 Robertsville Road, Suite B  
Oak Ridge, TN 37830  
Phone: (865) 483-1333  
Fax: (865) 482-6572  
E-mail: <loc@icx.net>  
Web site: <www.local-oversight.org>

### **City of Oak Ridge Environmental Quality Advisory Board**

James Groton, Chair  
Mary Mason, Administrative Assistant  
City of Oak Ridge, P.O. Box 1  
Oak Ridge, TN 37831-0001  
Phone: (865) 425-3531  
Fax: (865) 425-3409  
E-mail: <mmason@cortn.org>  
Web site:  
<<http://www.cortn.org/government/boards>>

### **Roane County Environmental Review Board**

Robert Peelle, Chair  
Roane County Courthouse  
P.O. Box 643  
Kingston, TN 37763  
Phone: (865) 376-5578  
Fax: (865) 376-4318  
E-mail: <peellerw@comcast.net>

### **Oak Ridge Site Specific Advisory Board**

Steve Dixon, Chair  
Spencer Gross, ORSSAB Support Office  
P.O. Box 2001, EM-90  
Oak Ridge, TN 37831  
Phone: (865) 241-4584  
Fax: (865) 574-3521  
E-mail: <GrossRS@oro.doe.gov>  
Web site: <[www.oakridge.doe.gov/em/ssab/](http://www.oakridge.doe.gov/em/ssab/)>

### **League of Women Voters of Oak Ridge**

P.O. Box 4073  
Oak Ridge, TN 37831-4073

Phone: (865) 482-2243  
E-mail: <lwvor@comcast.net>  
Web site: <[www.lwvor.com](http://www.lwvor.com)>

### **Community Reuse Organization of East Tennessee**

Lawrence Young, President  
107 Lea Way  
P.O. Box 2110  
Oak Ridge, TN 37831-2110  
Phone (865) 482-9890  
Fax (865) 482-9891  
E-mail: <younglt@croet.com>  
Web site: <[www.croet.com](http://www.croet.com)>

### **Energy, Technology, and Environmental Business Association**

Pete Greenwalt, Executive Director  
P.O. Box 5483  
Oak Ridge, TN 37831-5483  
Phone: (865) 945-1386  
Fax: (865) 945-1385  
E-mail: <pete@eteba.org>  
Web site: <[www.eteba.org](http://www.eteba.org)>

### **Atomic Trades and Labor Council**

P.O. Box 4068  
Oak Ridge, TN 37831-4068  
(865) 574-0153  
Web site: <[www.atlunion.org](http://www.atlunion.org)>

### **Paper, Allied-Industrial, Chemical, and Energy Workers International Union**

Local 5-288  
133 Raleigh Road  
Oak Ridge, TN 37830  
Phone: (865) 483-3745  
Fax: (865) 483-6460

### **Advocates for Oak Ridge Reservation**

136 West Revere Circle  
Oak Ridge, TN 37830  
Phone: (865) 483-0849  
E-mail: <aforr@discoveret.org>  
Web site: <[www.discoveret.org/aforr](http://www.discoveret.org/aforr)>



## STATE CONTACTS

### **Tennessee Department of Environment and Conservation Department of Energy Oversight Division**

761 Emory Valley Road  
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Radiological Monitoring and Oversight

## **Tennessee Emergency Management Agency**

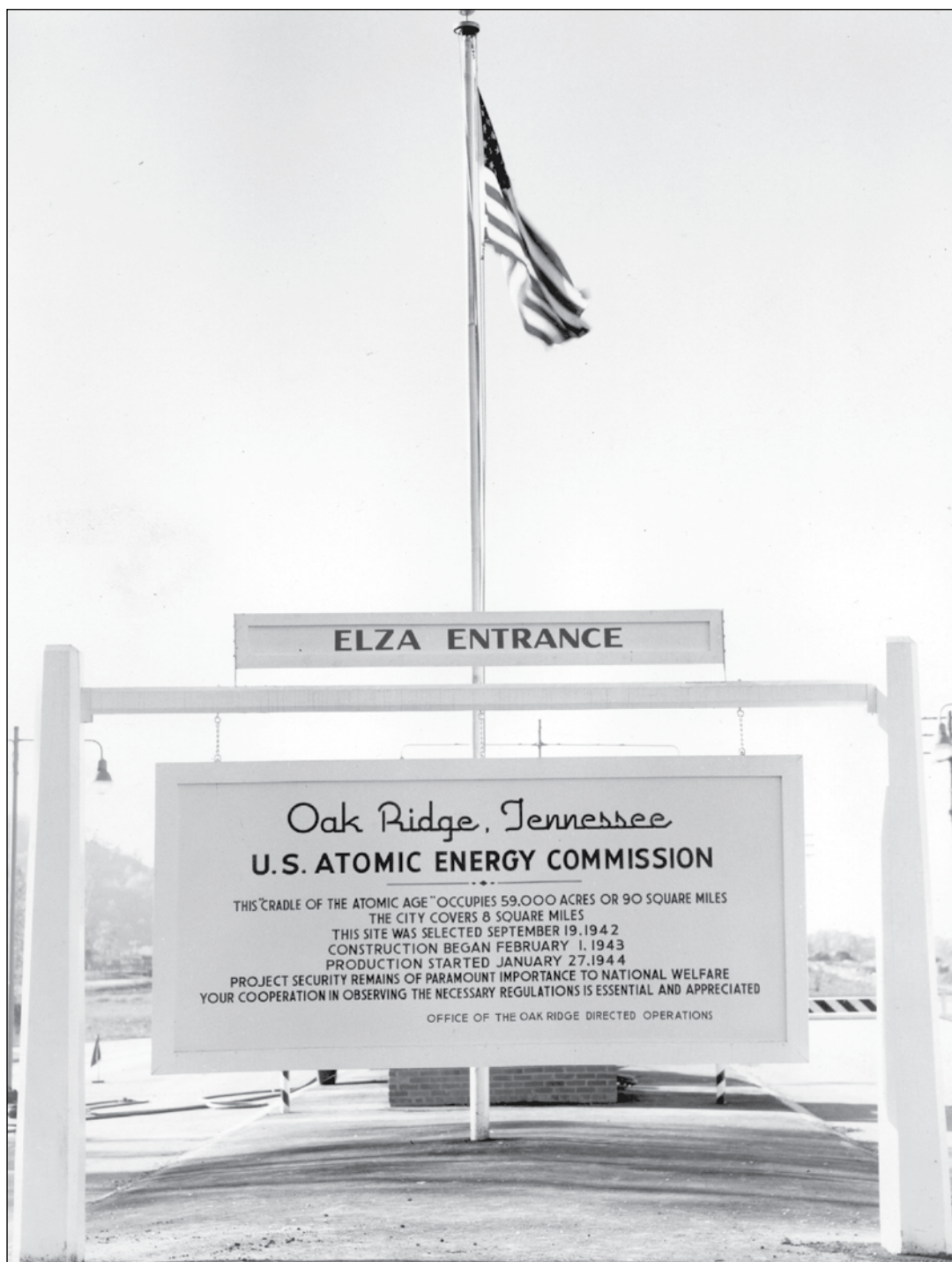
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TDEC photo

Division managers take periodic field trips together to better understand field conditions.



Historical photo from the Oak Ridge Reservation.

DOE photo

# Tennessee Department of Environment and Conservation

## DOE Oversight Division

Oak Ridge, Tennessee

